MODEL AIRPLANE NEWS

MAXIMIZE YOUR AEROBATICS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120 February 1996

Hot Photos & Facts — Full-Size Acrobats

NEW FOR '96

HOT R/C PRODUCTS EXCITING SNEAK PREVIEW — PAGE 16

Scale Masters Shootout

We show you how

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MODEL AIRPLANE NEWS

FEBRUARY 1996 • VOLUME 124, NUMBER 2

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reviews

ON THE COVER: *(main photo) Nick Tusa of East Moriches, NY, brings his impressive 1/3-scale Fokker D-VII in for a landing at the Scale Masters. See page 44 for more on this scale shootout (photo by John E. Jundt). Insets (top to bottom): a beautiful air-to-air flight shot of the IAC aerobatic One-Design (photo by Budd Davisson, whose article "The Acrobats" highlights the latest aircraft in the world of unlimited aerobatic competiton); a beautiful flight shot of John Cole's Curtiss Jenny at the Scale Masters; Global's Tecate bipe hangs on the prop while going through its paces (see "Field & Bench" review by Roger Post Sr. and Mike DeHoyos on page 30).*

ABOVE: *on final at the Scale Masters—a beautifully built Proctor Albatros built by Gary Parker. This fine model won the Pilots' Choice for Best Military award.*

EDITORIAL

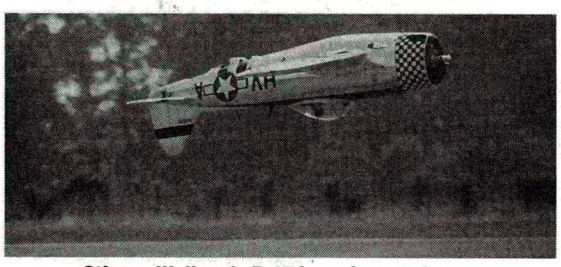
by TOM ATWOOD

FLY WITH THE BEST

Top fliers advise that if you want to speed the development of your flying skills, fly as many different types of R/C aircraft as you can.

Fair enough, but once you have your hands on the new airplane that's going to expand your flying horizons—and are counting the days until you can take it to the flying field—wouldn't it be helpful to have ready access to the insights and techniques of a top flier who is a master at flying that type of aircraft? Suppose you are interested in competing; wouldn't it be helpful to be advised by a pro who has taken home the gold?

We contacted some of the best R/C pilots around to ask if they would like to contribute to a book on R/C piloting. The result is a unique volume of nearly three dozen flying-technique articles—"R/C Pilot's Handbook," by 30 of the leading R/C pilots of our time. We believe that it is an important enough work to merit a summary description on this page. Here's what's in it.



Stinger Wallace's P-47 in an inverted pass.

• **Basic techniques.** *Model Airplane News* columnist and test pilot Dave Baron offers guidance for the novice in "Getting into R/C Planes." If you're serious about R/C flying, the nuances explained by associate editor Roger Post Jr. (technical editor of the book and a full-scale pilot) in "How to Use the Rudder" are essentials. In "Approach to Landing," full-scale pilot Bob Gilbert describes flying the basic landing pattern.

"How to Avoid the Stall/Crash Quandary" by seasoned R/C flying pro Dan Parsons (also a full-scale pilot) will help you keep your model out of dicey situations. "The Merry Modelers' Mindset" by Roy Clough—a pioneer in the hobby and a contributor to *Model Airplane News* since the early '50s—shows how to train yourself to make instinctive (and correct) control inputs. Finally, "How to Avoid Crashing" by Roger Post Jr. tells you what to do in near-stall and related tough situations.

• **Intermediate flying skills.** Dan Parsons' "Tail-Dragger vs. Trike Gear" shares knowledge all R/C'ers should master; and master R/C aerobatic flier and aircraft designer Dave Patrick shares more in this vein in "Crosswind Takeoff and Landing."

Nick Ziroli, master scale designer, builder and flier, offers valuable advice in "The Multi-Engine Experience." Dan Parsons follows up with additional flying hints in "Multi-Engine Techniques." *Model Airplane News* "RPM" columnist Dave Gierke offers key insights into matching engines, props and airframes in "Maximizing Engine Performance."

Larry Renger, an accomplished model aerodynamicist and designer, may surprise you in "Fine-Tune Your CG by Flight Testing." When your thumbs have mastered cross-controlling and you're ready to slip your ship, see Roger Post's "How to Slip an Airplane."

• **Aerobatics.** In "The Art of Low-Power Aerobatics" (printed in this issue), world-famous electric-scale modeler and R/C show pilot Keith Shaw offers useful lessons that also apply to glow aircraft that are not overpowered. For more extreme flying, see experienced R/C show pilot and aerobatic model designer Frank Noll Jr.'s "Hot-Dogging it with Frank Noll Jr." Want to drag a fin in the grass during inverted flight? Stinger Wallace shares this trick and more in "Hotshot Flying—*Stinger* Style."

In "Fun-Fly Competition," competition fun-fly airplane designer and champion Jerry L. Smith orients you for competition. Accomplished model designer and aerobatic slope pilot Jef Raskin tells you how to identify and resolve trimming problems in "How to Trim Sailplanes for Aerobatics." These lessons also apply to sport planes.

• **Scale.** Terry Nitsch, the winner of two consecutive Top Gun contests, the '95 Scale Masters and numerous other events, offers invaluable advice in "Scale Competition Flying Tips." George Leu, scale competition flier, former Top Gun chief judge and a *Model Airplane News* scale columnist, tells you how to drop that ordnance in "Scale Bombing Techniques."

• **Racing.** In "Enjoy .40-Size Pylon Racing," world-famous champion pylon racer Dave Shadel offers insight into how to win. Successful giant-scale racer and exhibition pilot Dennis Crooks offers seasoned advice in "So You Want to Try AT-6 Racing?" In "Go Fast and Turn Left," Rob Wood, giant-scale racing correspondent for *Model Airplane News* and manager of a successful racing team, summarizes the techniques and strategies learned from the pros on the giant-scale racing circuit. In "Speed 400 Pylon Racing," Tom Hunt reveals how to successfully fly those inexpensive yet demanding electric racers.

• **Soaring.** Mike Lachowski, *Model Airplane News* soaring columnist, sailplane designer and successful competitor, gives you all the answers to finding lift in "How to Soar with the Eagles." David Garwood, *Model Aviation's* soaring columnist and a long-standing contributor to *Model Airplane News*, offers tips for the newcomer in "Your First Glider Competition" and "Slope Soaring." Dennis Phelan, a member of the National Soaring Team, covers the competitive sport of F3B thermal soaring, and Brian Agnew, national hand-launched glider champion, gives you the scoop in "How to Handle Hand-Launched Gliders."

• **Special interest.** Dan Luchaco's "Sport Fun Fly" will help you take home the honors the next time you compete at a club fun fly. Greg Rose, *Model Aviation* combat columnist and longtime expert, gives you an edge on the competition in "Flying R/C Combat." F5B world champion Jerry Bridgeman discusses how to fly battery-powered "rocket ships" in "Tips from an F5B World Champ!" Champion Tom Hunt gives you the lowdown on limited duration electric competition in "Flying Class A and B Electric Sailplane Events." Bob Aberle's "Flying Old-Timer Model Aircraft" shares tips he has used to take the honors at contests too numerous to summarize. "Basics of Flying Ducted Fans" by nationally renowned ducted-fan modeler and pilot Bob Fiorenze tells you what you need to know. If you have an interest in this volume, it's advertised later in this issue.

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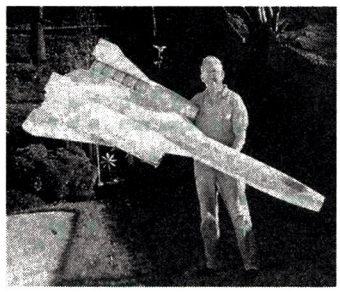
WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 25 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.



INCOMPLETE BLACK BIRD

Help! About six years ago, I sent for and received a set of Ralph Saldivar 1/12-scale S.R. 71 Black Bird plans. At this time, the model is about 70 percent complete, but the problem is that my plans have been destroyed. Could someone help me find another set? Any help would be greatly appreciated.

GEORGE CAUTHEN
987 Gina Ct., Oakdale, CA 95361

It would be a shame not to finish such a grand modeling project. If anyone can supply George with plans for this great-looking model or an address for Ralph Saldivar, please contact him directly. GY

BUILDING TIPS

I've enjoyed recent flying-technique articles by Roger Post. They're useful, informative and have great illustrations, and they've helped me to improve my flying skills. Unfortunately, not all of my flying has been as successful as I would like, and the result has been necessary rebuilds and repairs. Could you do some building-technique articles similar to Roger's flying articles? I get so much out of your other articles, I'd really like to see more "How To" articles pointed at builders, rebuilders and scratch-builders. More specifically, I would like to know how to install triangular stock on models for added reinforcement. How do you accurately measure, cut and fit these pieces to a model? Thanks again for a great mag, and thanks for your help.

DAVE SPENCER
Dayton, OH

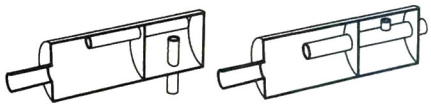
Dave, adding triangular stock to models is one of the basic modifications that can be done to improve structural integrity. Contrary to popular belief, the added wood is not what makes the model stronger. The additional gluing surface that the triangular stock provides strengthens the joint. Adding a very large fillet of epoxy or other glue is not as effective.

To make precise, well-fitting joints in triangular stock, you'll need a miter box and a razor saw. Ninety-nine percent of the time, the inside angles of a typical sport model are like a box structure; the tops and bottoms are flat and at 90 degrees to the fuse sides. So, to add triangular stock in the corners, you first apply as many as possible full lengths of triangular stock with square ends cuts. Then the adjacent pieces can be mitered to fit against those already glued into place. The ends should be cut at 45 degrees. Also, to make the stock fit up against the formers and sides nicely, remove some of the material from its center corner edge. This allows the stock to fit tightly into the corners of the model's interior. Finally, don't get carried away; reinforce only those portions of your model that really need it. The area around the firewall and above the landing gear and critical formers that bear flight loads can benefit from reinforcement. Other formers are usually along just for the ride and don't need the extra strength or the weight of the triangular-stock treatment.

As for "How To" articles, check out our "Scratch-Builder's Corner." GY

MORE SOUND ADVICE

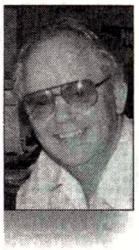
I was very glad to see my article "Sound Advice from Europe, Part 1" in print in the November '95 issue of *Model Airplane News*. I hope that it will help modelers in the U.S. who are dealing with noise problems. I would, however, like to make a few minor corrections to the illustrations. In Figure 6, two diagram captions were switched; they should read like this:



Side outlet — Combined pipe resonator and side branch

Also, I would like to clarify that the "hard-rubber dampers" in Figure 9 should be soft instrument dampers with a durometer of 40 to 60.

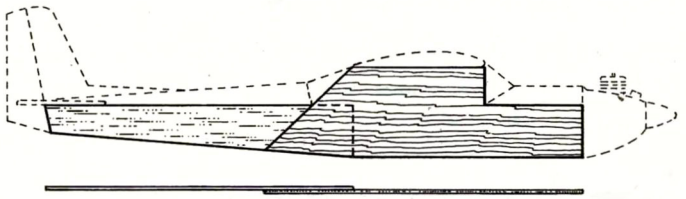
I look forward to more discussions on noise; it's something all modelers should be aware of. TORE PAULSEN



Hints & KINKS

by JIM NEWMAN

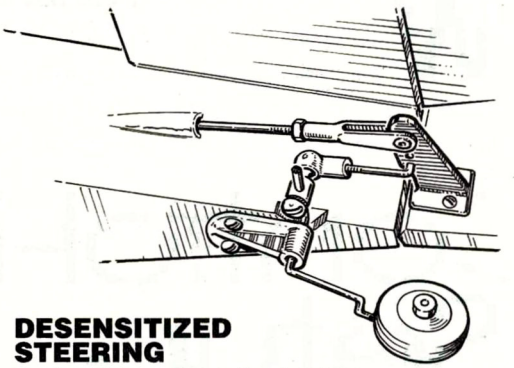
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



WOOD ECONOMY

Save on materials by overlapping the forward ply fuselage sides and the lighter balsa of the rear fuselage; this also keeps the tail light. With judicious sanding and a well-designed color scheme, the overlap is virtually invisible.

E. Kennedy, Wanniassa, Canberra A.C.T., Australia



DESENSITIZED STEERING

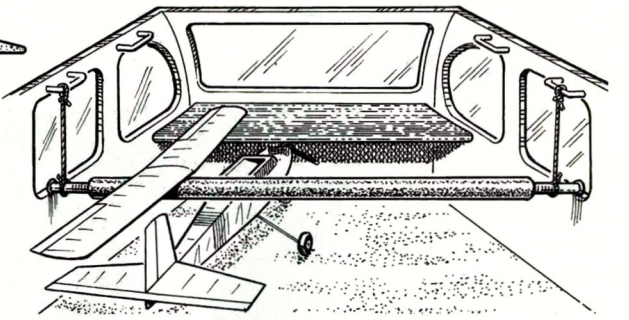
By installing the tail wheel as shown, you can adjust it so that it has considerably less throw than the rudder (a desirable setup for the novice pilot).

Manuel Fuentes Rendon, Veracruz, Mexico

READY-MADE BUSHINGS

Stop in at your local crafts store and get some wooden pill bottles for about 39 cents each. These will fit ¼-20 wing bolts and, if one is carefully sawed through, it will provide a pair of bushings for the wing bolts. Ron also recommends checking the doll-head section of the store for pilot figures.

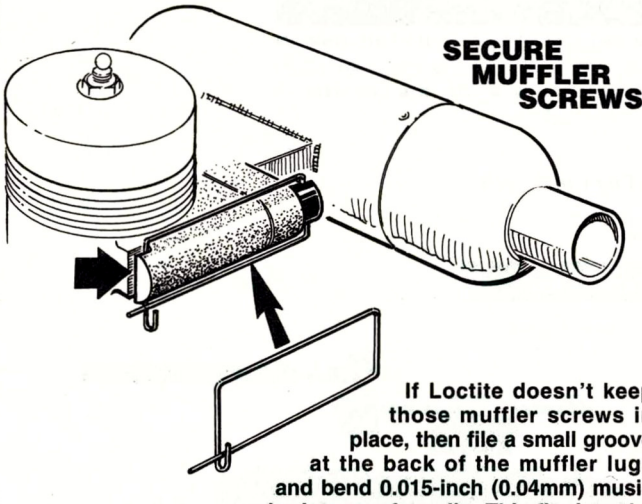
Ron Ogren, Orchard Park, NY



BIG PLANES, SMALL HATCHBACK

Cover an expandable curtain rod with foam pipe insulation, then suspend it from the grab handles so that it fits tightly as shown. Set the wings on the rod and the rear security cover, and run the fuselage underneath, using suitable chocks to prevent it from rolling back and forth. Keep heavy objects, such as the field box, ahead of the models and up against the seats.

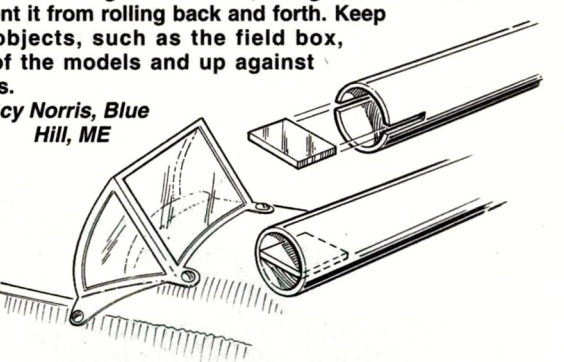
Nancy Norris, Blue Hill, ME



SECURE MUFFLER SCREWS

If Loctite doesn't keep those muffler screws in place, then file a small groove at the back of the muffler lugs and bend 0.015-inch (0.04mm) music wire into a safety clip. This fits into the screw slot and the groove and prevents the screw from vibrating loose.

Don Dolan, Hobart, IN



MINI SCREWDRIVERS

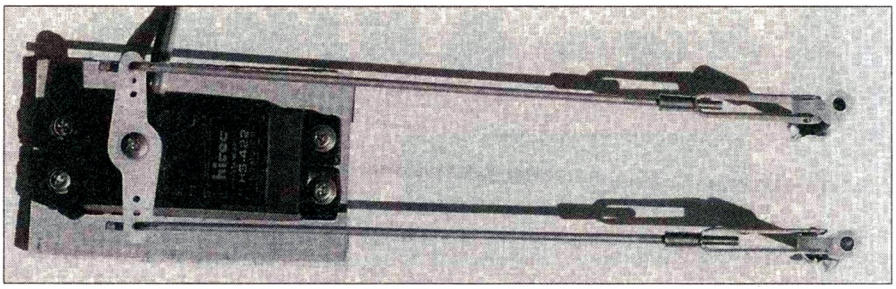
If you use miniature nylon or metal screws to attach windshields, etc., make this non-slip screwdriver by soldering a brass "blade" into a tube, then glue this into a dowel handle. If the tube is large enough, you can slip the blade inside, but if not, slit the tube with a Zona saw or a similar cutting tool.

Phil Snyder, Phillipsburg, NJ

MODEL AIRPLANE NEWS

HOW TO

by GERRY YARRISH



A typical aileron linkage set up for a .40-size sport model. The clevises are attached to the vertical arms of the aileron torque rods but no stop nuts are installed. Stop nuts are very good insurance against slop and should be used whenever possible.

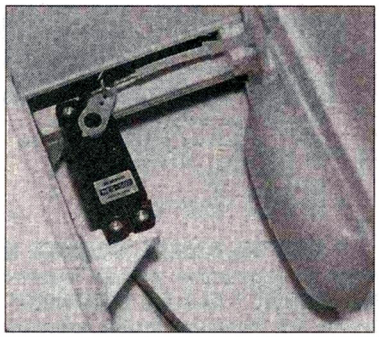
WHETHER YOU'RE building your first high-wing trainer or scratch-building an original-design, giant-scale unlimited racer, you have to connect servo movement to control surfaces. There are many types of setups, and hobby shops are full of hardware to accomplish this task. Here's some basic setup information that you can apply to your model.

Control-Linkage Setup

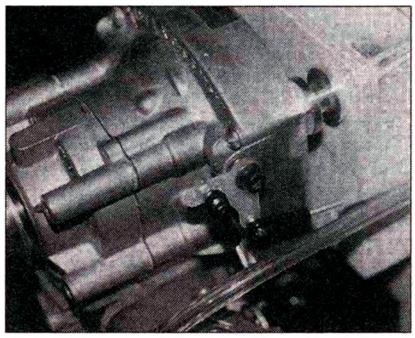
A basic approach for maximum control response

• Low-power trainers

In a typical trainer (.25- to .45-size), the beginner can do no better than follow the manufacturer's directions. In most cases, elevator and rudder are actuated by solid-wood pushrods. The pushrods typically have metal wire ends so that the pushrod can be connected to the servo (with a Z-bend) and to the control surface (by means of a threaded end and a clevis). The illustrations show the most basic setup for elevator and rudder. Usually, 1/4- to 5/16-inch-square balsa stick stock is used for the pushrods. The 2-56 pushrod wires are bent 90 degrees as shown and inserted into a hole drilled through the pushrod. The wire rod end is then bound with thread and glued (some trainers use shrink-tubing in place of thread).



Quick-type links, such as this one on my throttle servo, are good for easy adjustment and simple setup. Don't use these links on your elevator servo.

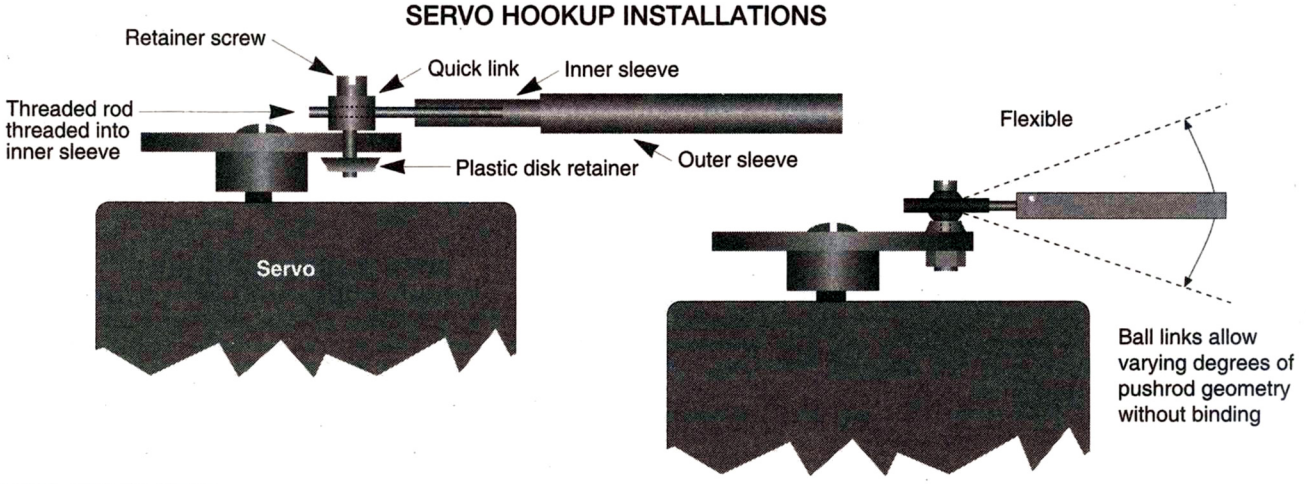


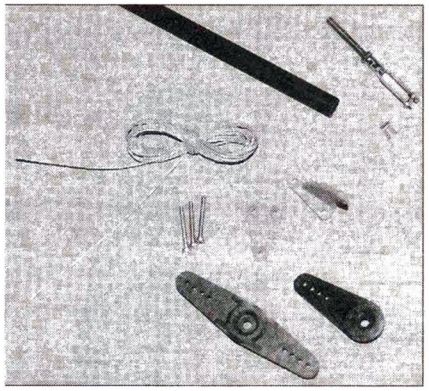
Ball links used in this throttle-linkage setup minimize slop and allow for slight misalignments while the throttle is advanced and retarded.

• Sport models

Once past the trainer stage, most modelers move up to faster, more powerful sport models in the .40- to .60-size range. Low-wing and other high-performance models generally include aileron control as part of the linkage installation.

Harder wood, such as birch dowels, is needed for these types of models. These dowels work well and provide stiff control response; however, they need to be kept as short as is practical to minimize vibration and possible flutter. Supporting the middle of the pushrods with a





Here are some aftermarket control-linkage parts. Included are a carbon-fiber, arrow-shaft pushrod; a 4-40 threaded rod and clevis (notice the clip retainer); Kevlar pull/pull thread; Robart's ball-link control horn; and Du-Bro* reinforced giant-size servo arms. These extras can increase your model's longevity.

bulkhead or a couple of cross-braces will do the job nicely, but the friction between the rods and the support should be minimal. A good safety practice is to use a short length of fuel tubing as a clevis keeper.

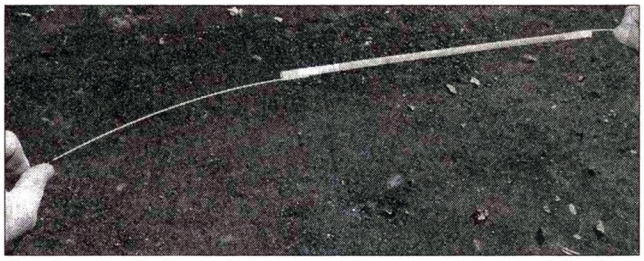
To save weight, many modelers also use hollow carbon-fiber or fiberglass arrow shafts for pushrods. The flexible or "tube in a tube" pushrod is also popular and works well if it's installed properly. The outer sleeve must be supported every 6 to 8 inches along its length, and the inner sleeve must slip easily through the outer sleeve without binding. Bends in the pushrod must be gradual and smooth.

• Pull/pull control

Typically, a pull/pull control setup consists of thin, braided, metal cables or Kevlar thread. Pull/pull control is very popular among scale modelers and pattern fliers who demand precise rudder control.

• Pushrod hardware

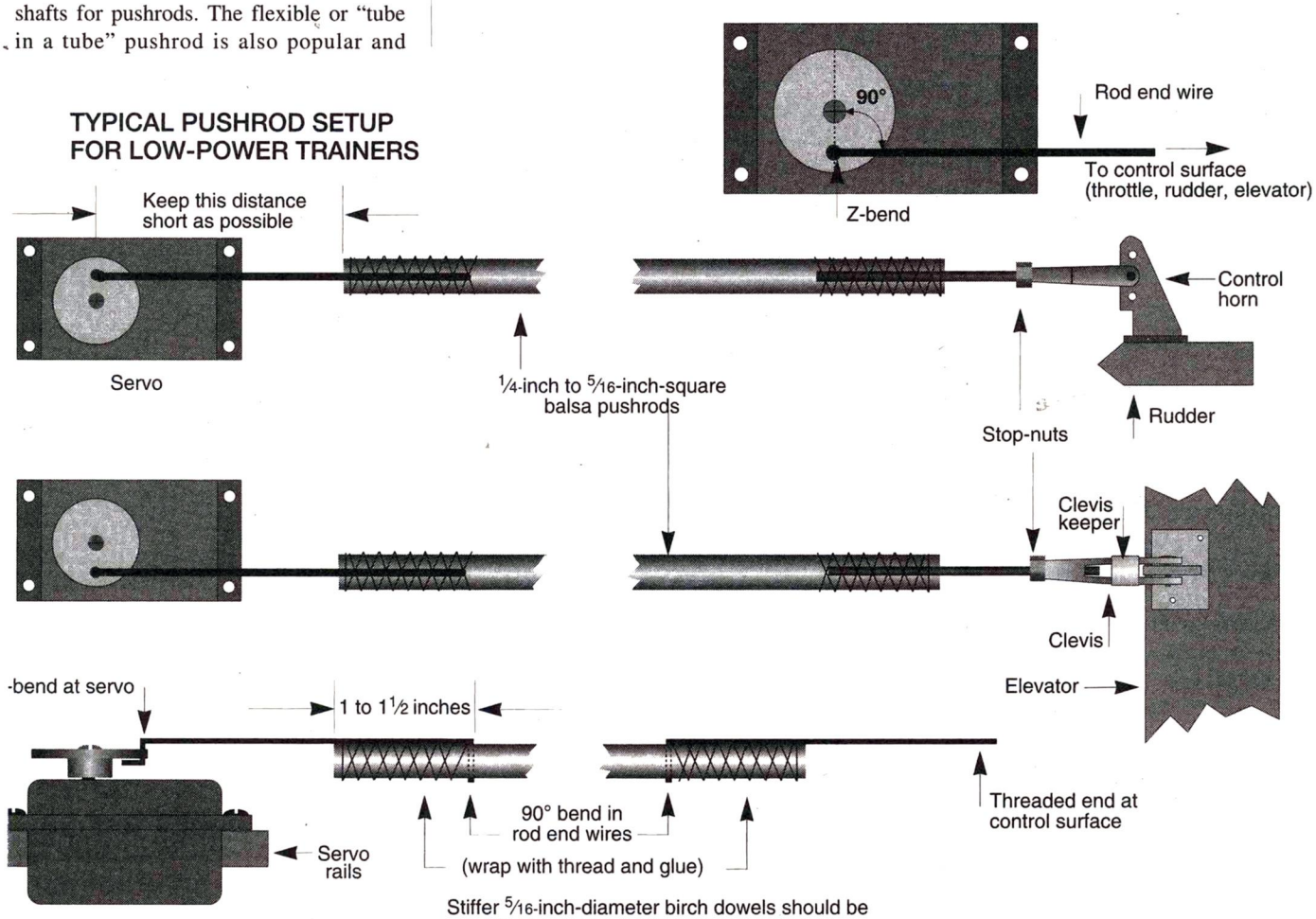
The size of control horns, clevises and threaded rods depends on the size of the model. The 2-56 hardware is good for small models (up to .40-size), and it can also be used in larger, less powerful models, such as .60-size Cubs. The larger, stiffer 4-40 hardware is well-suited to giant-scale hot rods, such as Lasers and Extras.



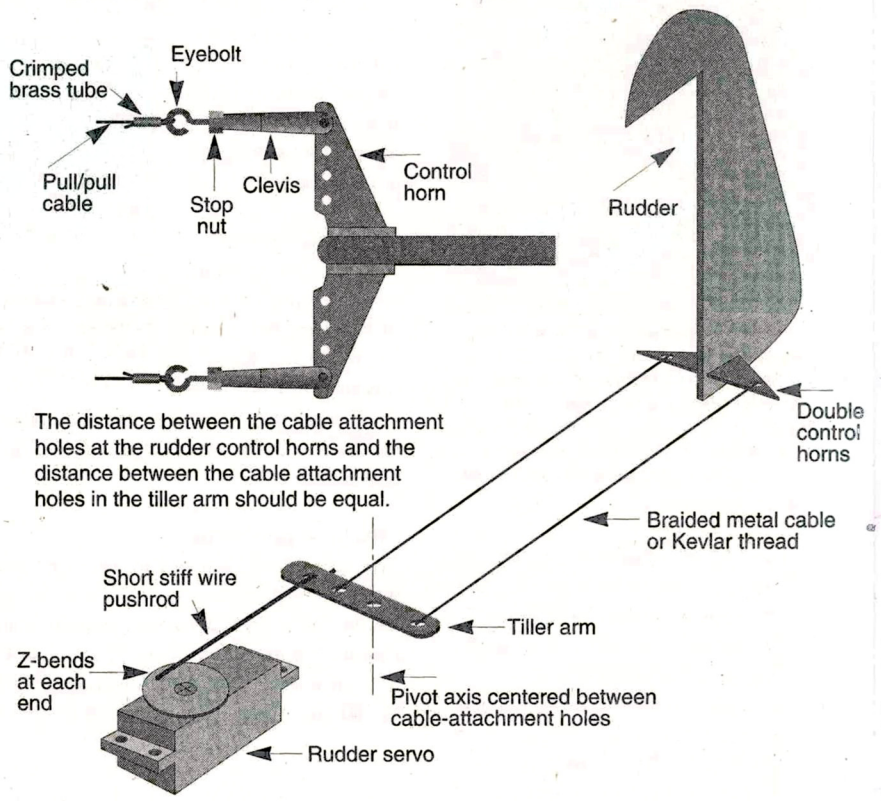
Here's a typical wooden pushrod from a low-powered trainer. Made out of a ¼-inch-diameter dowel, it has 2-56 wire ends and a 2-56 clevis. Without support, it bends easily—even with slight finger pressure.

• Ball links

Ball-link clevises and control horns provide precise control action and allow varying degrees of pushrod geometry without drag or friction. Ball links should be used only at the servo end of a pushrod and not at the control horn. Placing an "offset" ball link at the control horn causes an out-of-align connection that tends to twist the horn under severe flight loads. Robart's* new ball-link control horns are the excep-



CONTROL-LINKAGE SETUP



tion because the ball link is captured "in line" with the control-horn's arm.

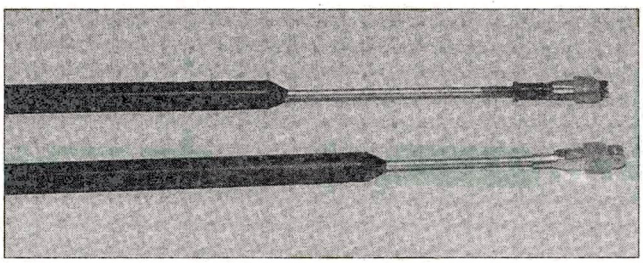
A good place for ball links is at the engine's throttle-control arm. In gas engines, where there is usually a bellcrank, ball links automatically compensate for misalignment, and they minimize slop.

• Quick links

Quick links are small metal attachments that are held to the servo's arm with a plastic disk, and they have holes drilled in their sides that accept a cable or a music wire-rod end. These are good for simple installations, such as the throttle, but they shouldn't be used for elevator control. Again, the size of the model and the flight loads will determine which type of connector to use.

• Servo arms

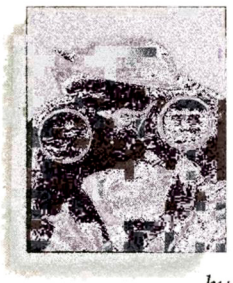
Most models work very well with the standard arms that come with the servo. There are now a number of aftermarket servo-control arms that are bigger, stiffer and stronger than the stock ones. Generally speaking, the pushrod should always be 90 degrees to the control arm in the neutral position. An exception to this is in aileron setups where you may want differential control, but this will be discussed in a future control-linkage setup article.



Small lengths of fuel tubing make quick and easy clevis keepers—cheap insurance for preventing a clevis from becoming disconnected from the control horn.

For proper control of your model, you have to know the basics of control-linkage setup. Minimizing slop and maximizing control stiffness will help keep your model in one piece.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*



NATIONAL MODEL & HOBBY SHOW

AirSCOOP

by CHRIS CHIANELLI & HIS LOYAL STAFF

NEW FOR '96

Every October, at the National Model and Hobby Show in Rosemont, IL, hundreds of hobby manufacturers show their wares and announce new products for the coming year. Here's a sample of just some of the exciting new products we saw at the latest show.

Estes Blasts into R/C

Estes Industries showed off its Sterling Models acquisitions and its entire line of rubber-powered, free-flight and R/C products. Estes plans to systematically evaluate the entire Sterling line and will revitalize many of the golden oldies most of us grew up with.

Estes is also the exclusive distributor of the Russian-made MDS ABC, Schnuerle-ported .15, .25, .40, .46 and .61 R/C engines ($54.95 to $109.95). The MDS engines come from the engineers who put the Russian Soyuz space program together. Estes also distributes Weston U.K. custom R/C engine accessories, including their Viper ($61.95 to $81.95) and Genesis ($41.95 to $89.95) mini-pipe mufflers and soft mounts for 2- and 4-stroke engines and ducted fans ($52.95 to $86.95).

• Estes Industries, 1295 H Street, Penrose, CO 81240; (719) 372-6565; fax (719) 372-3419.

NEW FLIGHT SIM

Distributed exclusively by Horizon Hobby Distributors, the Northern Helicopter Products 3 in 1 Flight Simulator will keep you flying year-round. It features airplanes and helicopters, as well as the ability to design your own aircraft. Change from a high-wing trainer to a low-wing aerobatic plane to a helicopter—even vary the control-surface throws and engine size or change the weather to practice those crosswind landings. And you can use your own transmitter with this program.

When the plane goes out beyond the pylons, "binocular vision" is activated to bring it closer to you. The NHP R/C Flight Simulator is compatible with IBM 486 PCs and comes on a 3.5-inch disk and with an interface adapter, interface cord and complete instructions.

If you're on a budget, check out the F400—an inexpensive, 4-channel radio that comes with the micro-size (ABC & W) R600 FM receiver, three S507 servos, 600mAh Ni-Cds, a charger, a switch harness, an aileron extension cord and accessories.

Featuring five, machined-brass gears, the JR 351 Sailplane Servo is a version of the popular 341; if you have the 341 and would like to convert it to metal gears, there's now a conversion set available to do just that.

• Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

BYRON'S Thunderbird

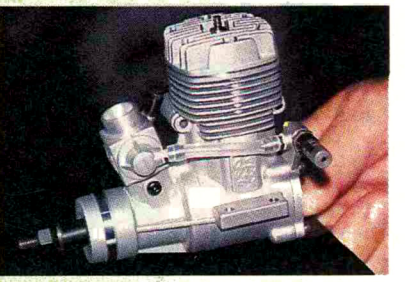
Big and impressive, like so many of the Byron kits, this 1/6-scale, 82-inch-wingspan, 72-inch-long T-33 (IMAA-legal), has a hand-laid fiberglass fuselage and wire-cut, foam wing-cores that are ready for sheeting. The kit features Byron's plug-in wings and includes fiberglass plug-in tip tanks. Also in the package are a clear canopy, partial cockpit, all the necessary balsa and plywood, hinges, pushrods, fuel tank and hardware. Custom retracts are options. The T-Bird can be powered by a Byro-Jet performance package with an O.S. .91 or a Rossi .90. The T-33 should be available by the time you read this. • Byron Originals Inc., P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-2028.

Great Planes Squadron

The Top Flite sport-scale .40 Corsair ($179.99) features a simple flat-sided fuselage construction; and the Gold Edition P-47D Thunderbolt ($249.99) now has many scale accessories—drop tanks, dummy radial engine, scale prop and a full, scale-cockpit interior kit.

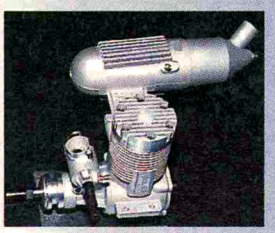
The new Focke-Wulf Fw-190 ARF ($299.99)—a .40- to .50-size dogfighter that comes 90-percent assembled—is a perfect match for Great Planes' Spitfire and Mustang ARFs. Wanna-get-into-the-air-quick acro pilots should check out Hobbico's .60-size Extra 300 ARF ($339.99). Two new O.S. glow engines with a really nice safety feature are the Max-23SX and the Max-40FX. Their needle-valve assembly is behind the cylinder head—far away from the prop.

• Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; (217) 398-1104.



GLOBAL ASSAULT

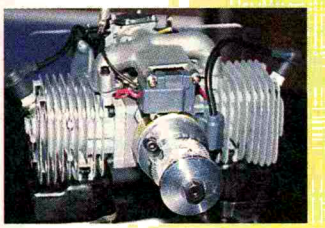
Global showed its line of almost-ready-to-cover (ARC) and almost-ready-to fly (ARF) scale and sport-scale models. Shown here by Global's Mike Greenshields is the new EZ .60-size, 72-inch-span, Cessna 182 Skylane ARF.



It has optional flaps, a molded cowl and wheel pants and all the hardware (part no. 126250, $399.95). The Model Tech ARC .60- to .90-size, 66-inch-span P-51D Mustang comes built—all-wood wing and fuselage and airfoil-shaped tail parts. Retract mounting rails and wheel wells have been installed and cut out, and the flaps, ailerons, rudder and elevator are ready to hinge. The P-51 package includes all hardware, wheels, fuel tank, engine cowl, and formed wing fairings (part no. 123645, $340). Global also showed its line of Magnum engines, including the new Magnum .91 and the 1.08 (part nos. 210805 and 210810, $250 and $280, respectively.

• Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

ISC Intl. displayed their new Z-445 Zenoah twin-cylinder gas engine. Rated at 5.5hp (with stock mufflers) and 6.6 to 7hp without mufflers, it's 10.28 inches wide, 7.66 inches long and 4.36 inches high, and it comes with a radial mount, a spring starter system and two mufflers. ISC also showed off their 1-800-COLLECT Tucker Special biplane. Jimmy Goad Jr. placed second in the biplane class at Madera with the Z-445-powered bipe! A kit is in the works, designed for the G-62 or Tartan 3ci twin-cylinder engines! Also shown was the new Aero Sport EDL-II computer-controlled data logger, which uses a Hall-effect sensor and a thermocouple probe to record more than 30 minutes of engine speed and temperature data in its solid-state memory. It consists of an onboard data logger and the HHD-II hand-held display. Use the EDL-II to optimize mixture settings, prop selection and engine-cooling setup.



• ISC Intl., 10620 N. College Ave., Indianapolis, IN 46240; (317) 846-0766; fax (317) 848-1015.

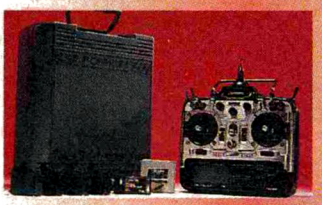
Info from ISC

NEW FOR '96

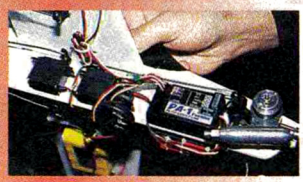
FUTABA FINDINGS

Here's something great for beginners! Futaba debuted their PA-1 Pilot Assist Link—an innovative autopilot system that uses specially designed optical sensors to detect the horizon and stabilize the airplane's attitude, compensate for wind conditions and correct pilot error (list price: $179.95).

Futaba also introduced System Eight radios—FP-T8UAP, 8UAF, 8UHP and 8UHF. Modeled after the 9Z Series, they offer precise digital trims and eight built-in model memories that can be expanded to 16 with the optional Campac module. Here's some ingenious packaging: the plastic case that the radio components come in is also a transmitter case.



Other news: the FP-G501 Rate Gyro uses a piezo-electric ceramic element instead of rotating sensor to detect motion.



• Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888; fax (714) 455-9899.

Thunder Tiger Leaps Forward

These ready-to-fly (built and covered) gliders are available in time for spring. For beginners, the 59-inch-span Sparrow 1500 comes with a 280PH gear-reduction motor (mounted on a pod) and a 2-stick, 2-channel radio (list price: $253.99; available at: $169.99). The 82.7-inch-span Gull 2100 is powered by a 540PH motor and a Graupner folding prop (list price: $209.99; available at: $139.99).

The company also showed their three newest engines: the Pro .20 comes with a muffler that can be rotated 90 degrees for a cowled-in engine; the Pro 1.20-R, rear exhaust, is great for F3A pattern fliers; and the F-54S is a new 4-stroke with the same quality as the .91S. And they all have a 3-year warranty.

• Thunder Tiger, 2430 Lacy Lane #120, Carrollton, TX 75006; (214) 243-8238; fax (214) 243-8255.

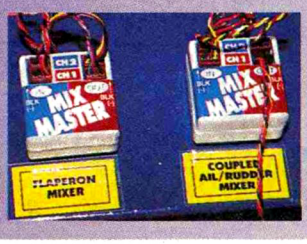
More from Altech

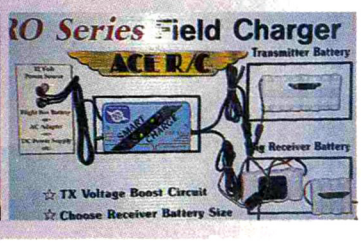
Weighing 13.4 ounces, the Enya .50CX ABC engine was designed for heavily loaded scale planes and for hot, .45-size precision aerobatic aircraft: 0.9 to 1.4hp range; 2,500 to 16,000rpm; and 11x6 to 13x8 props. It comes with the standard muffler, and there's an optional SM402X muffler (super-quiet type).

The Hirobo Schweizer 300—a.30-class, scale helicopter—features an FZ2 rotor head, Oleo-type skid, stainless-steel tail truss, aluminum tail-boom brace and a 2mm-diameter tail-drive shaft; 48.82-inch-diameter rotor; 40.35-inch-long fuse; weighs 7.05 pounds. • Altech, P.O. Box 391, Edison, NJ 08818; (908) 248-8738.

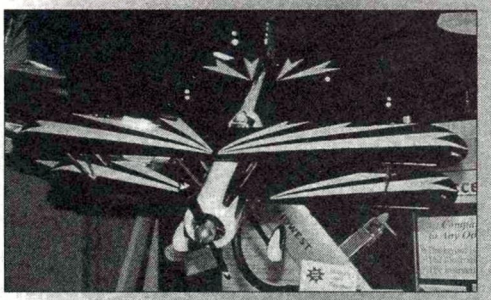
ACE R/C'S SMART ELECTRONICS

The new 12V Smart Charge uses a computer-controlled discharge pulse to strip oxygen bubbles off Ni-Cd batteries' internal plates. This reduces dangerous heat and pressure buildup inside battery packs. The Smart Charge also reduces the "memory effect" in batteries and revitalizes old packs. The Digital Dual Vari-Charger (DDVC) has two independent, adjustable outputs that provide up to 500mA of constant current. The DigiPulse Multi-Charger has six outputs, each of which will charge any 1- to 10-cell pack and can be programmed to charge from 10 to 140mA in 10mA increments to accommodate 100 to 2000mAh batteries. The Servo Master allows you to slow the servo response, and the Mix Master allows you to mix two channels without a computer radio. Both may be programmed with mini dip switches.





• Ace R/C Inc., 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (800) 322-7121; fax (816) 584-7766.



MIDWEST *Super Stearman*

Midwest seems to know how to pick subjects for successful kits. Their newest winner is the Super Stearman biplane. With a 65-inch span and 1,259 square inches of wing area, the 1/6-scale show plane is perfect for .60 to .75 2-stroke and .80 to .91 4-stroke engines. Featuring built-up balsa and plywood construction and aluminum landing gear and cabane struts, the Super Stearman follows the Midwest AT-6 Texan with its interlocking and self-jigging fuselage construction and is definitely on our list of upcoming product reviews.

• Midwest Products Co. Inc., P.O. Box 564, Hobart, IN 46342-0564; (219) 942-1134; fax (219) 942-5703.

HITEC/RCD'S SYNTHESIZED MEMORY

The Spectra module allows you to change the frequency on your Prism 7 radio quickly and safely. It operates in both the PPM and the PCM modes, and allows you to choose Mode I or Mode II operation. The 7-channel Prism is a three-model memory transmitter that comes with four HS-422 servos, an RCD Supreme receiver, a switch harness, full Ni-Cds and a charger. Spectra modules can be purchased separately or with the Prism 7 radio.

• Hitec/RCD, 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4940; fax (619) 449-1002.

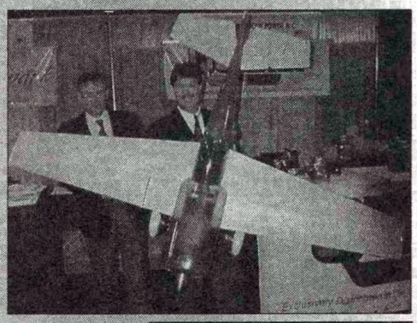
LARGE-SCALE RETRACTS FROM ROBART

New from the innovative folks at Robart is a complete line of retracts for large-scale models (15 to 25 pounds). The no. 630 Series retracts feature main gear units in 85- and 90-degree configurations and steerable nose gear in 100- and 105-degree configurations. All these retracts come with ½-inch-diameter, functional steel struts—either straight, offset, or forked Oleos (nose-gear only)—part nos. 630 to 634, 639 and 640. List prices: $129.95 (nose gear); $195/pair (mains).

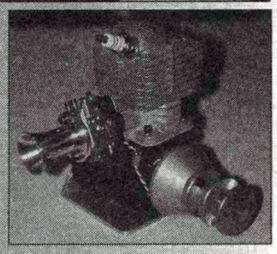
And check out Robart's complete retract systems designed for Wing Mfg.'s B-25 (part no. WB25) and Ziroli's F9F Panther jet (part no. ZF9F). They're constructed in the same way as the no. 630 Series retracts; list price: $325/set, including struts.

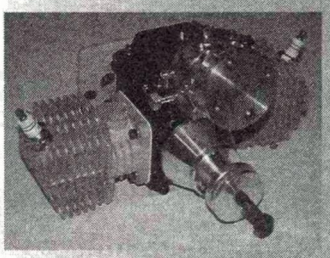
• Robart Mfg., P.O. Box 1247, St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

North American Power R/C Products



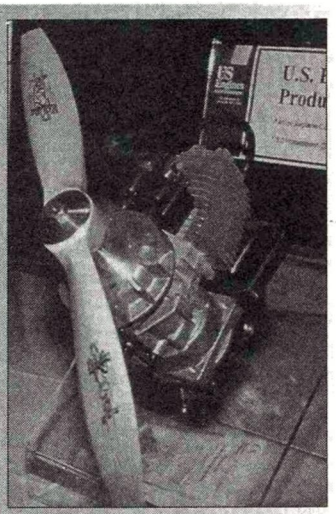
Exclusive U.S. distributors of the popular Quadra Aerrow line of gasoline engines, North American Power R/C showed off their new acquisition—the Sky Tech product line, including the 30-percent-scale Super Star. We also saw the lightweight Q52XL (3.2ci, 3.8 pounds) and the powerful twin-cylinder QA105XL gas engines (6.4ci, 6.6 pounds). All XL Series engines include an IntelliSpark electronic ignition system. This easy-to-use system has two band-timing settings for low and high rpm ranges, auto-retard for easy starting and a sleep mode to prevent accidental starting; and it can be fine-tuned while the engine is running.





• North American Power R/C Inc., P.O. Box 92638, Southlake, TX 76092; (817) 251-0787; fax (817) 251-0547; e-mail: 102177.2456@compuserve.com.

U.S.-Made Gas Engines



New for beginners and serious giant-scale modelers are these 35cc (2.1ci) and a 41cc (2.5ci) gas engines from U.S. Engines. They all come with CDI ignition, a chrome-plated cylinder and a muffler. The 41cc engine is rated at 3hp and turns an 18x10 prop at 7,000rpm.

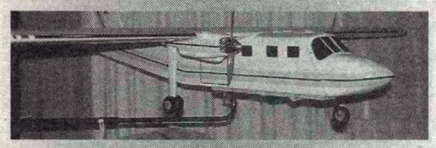
• U.S. Engines, 120 Wilkinson St., Syracuse, NY 13204.

NEW FOR '96

New from Cermark are these two ARFs—the .60-size F-20RG Tigershark and the electric-powered twin Islander. The 56-inch-span Tigershark comes covered in Ultracote and includes an aluminum spinner, mechanical retracts, Du-Bro hardware, an APC prop and Dave Brown wheels.

Cermark Selection

Weighing 8½ pounds, the 72-inch-span Islander requires two 05 electric motors and comes with all hardware. The Islander Combo package includes two motors and prop adapters. Also on display was the Thunder Tiger Micro Turbojet engine.

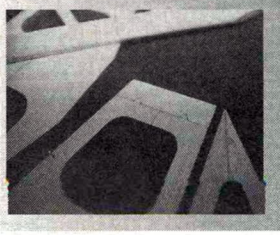


Cermark distributes the complete Thunder Tiger engine line and is the exclusive sales and service agent for the Micro Turbojet engine.

• Cermark, 107 Edward Ave., Fullerton, CA 92633 or 815 Oakwood Rd., Lake Zurich, IL 60047; (714) 680-5888; fax (714) 680-5880.

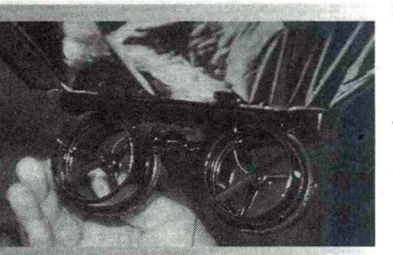
Sig Ultimate Precision

Sig's Mike Pratt told us about the improvements he has made to the Ultimate Fun-Fly bipe (shown here held by Barb Pratt) to make it perform even better. Available in early '96, the Ultimate Fun Fly bipe features removable wings, vacuum-formed wheel pants, formed-aluminum landing gear and a wing loading of 11.5 ounces per square foot. Sig has also perfected the art of laser-cutting wooden parts, which simplify building. The Ultimate Fun Fly and many of their other kits now incorporate laser cut parts.



• Sig Mfg. Co. Inc., 401-7 S. Front St., Montezuma, IA 50171-9900; (515) 623-5154; fax (515) 623-3922.

DAD and J'Tec—Quiet Pioneers



We spoke with Dave Abbe of DAD and found out that he's the pioneer who designed the details of the popular J'Tec Snuf-ler muffler line made to the Abbe/Tatone patents. The Snuf-ler (1989) is said to provide a 59.5-percent noise reduction compared with a standard muffler, and the newest version (top of photo), the 1996 Snuf-ler Plus, is said to reduce noise by 87.5 percent for a dB level of 84! We'll give you more information in future issues.

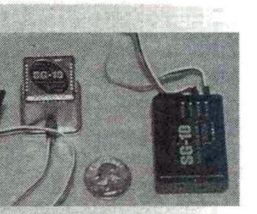
Dave also demonstrated his inexpensive ($12.95 plus S&H a set!) miniature electric power units and R/C transmitters for experimenters. Indoor R/C blimps anyone?

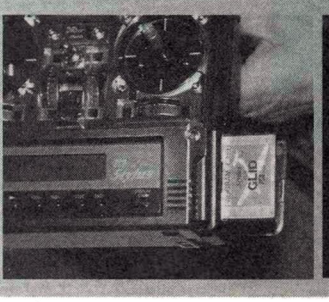
• DAD/FMA Group, 168 Main St., P.O. Box 711, Chadron, NE 69337; (308) 432-2122; fax (308) 432-2002.

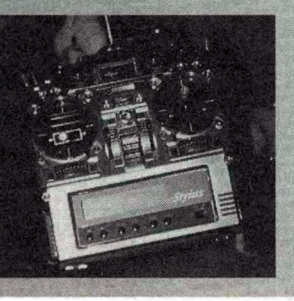
• J'Tec, 164 School St., Daly City, CA 94014; (415) 756-3400.

AIRTRONICS STYLUS

With advanced RF circuitry and clever programming, Airtronics' high-performance Stylus 8-channel system is said to feature the world's fastest 1024 PCM system. The Stylus is jam-packed with capabilities that serious modelers demand for all types of flying. Its list of features is staggering, and the folks at Airtronics didn't stop there. They offer a unique Memory Card System that allows you to upgrade to the next level of performance whenever you're ready. The Storage Memory Card lets you store up to 50 model setups. Available in FM and PCM, the Stylus comes with either four or five, 94322, 94732, 94735 or 94141 servos and a 700 or 1000mAh receiver pack.

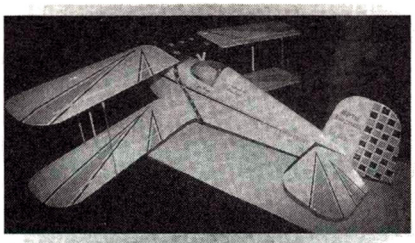






Airtronics' 96256 SG-10 Gyro was developed and designed with new materials and systems to counteract vibration and temperature changes, and it has an exponential function on its output. It has a high-performance piezoelectric sensor, and its high-speed response is achieved by incorporating a custom microprocessor and a high-speed analog to digital (A/D) conversion.

• Airtronics Inc., 11 Autry, Irvine CA 92718; (714) 830-8769.

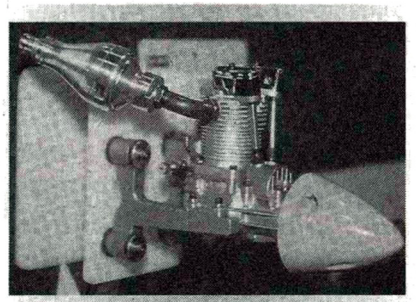


GOLDBERG

Bücker Jungmann

This impressive IMAA-legal Bücker Jungmann bipe has a wingspan of 64¾ inches and 1,152 square inches of wing area. Powered by a .61 to 1.20 2-stroke or .91 to 1.50 4-stoke, this model should really perform. The kit comes with scale, Dural landing gear; formed, stamped cabane struts; and a formed cowl, canopy and wheel fairings. For precise rolls and knife-edge performance, the model has virtually no pitch or roll coupling; it's exceptionally stable at slow speeds and can be landed at a walk.

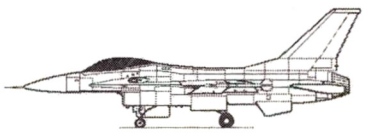
• Carl Goldberg Models Inc., 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550; fax (312) 626-9566.



ARISE FOR 4-STROKES

Du-Bro presented the next step in the Arise muffler line. The 4-stroke version has the same styling and efficient design as the popular 2-stroke muffler. We'll check this one out soon! Also definitely worth close scrutiny are Du-Bro's new line of light wheels.

• Du-Bro Products, 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; fax (708) 526-1604.



WINNERS' CHOICE

QUADRA AERROW

"Rock solid ... powerful ... dependable. Highly recommended."
-Gary Oliver, flight leader Skyhawks Exhibition Team, Aviation Expo "Striking Back" Show Team

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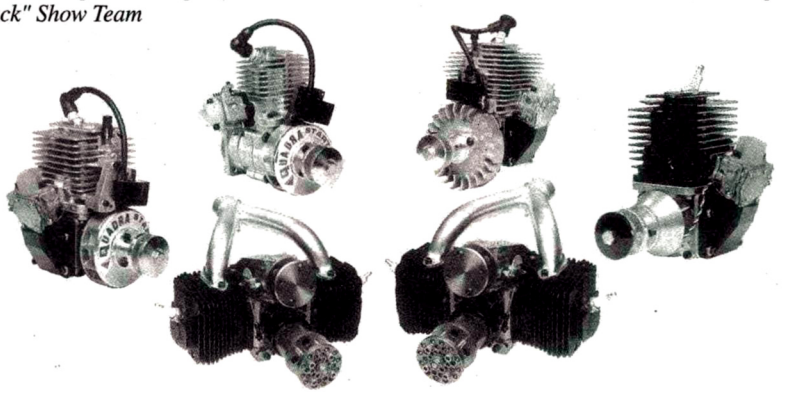

Pictured above: Q52s, Q75XL, Q65S, Q100S singles; QA200XL and QA150XL twins

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A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

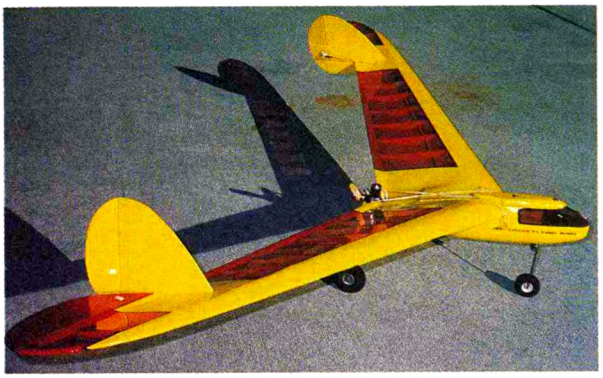
All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1995. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

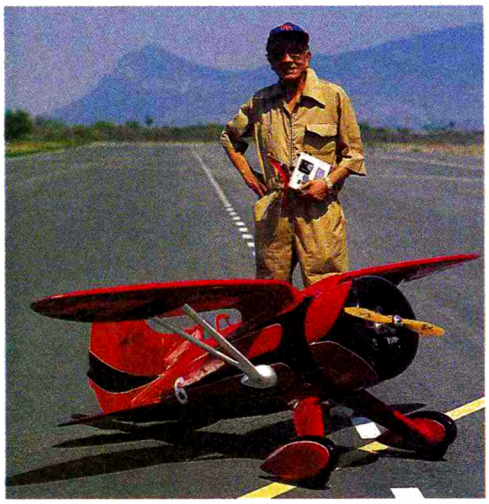
1/6-SCALE CLASSIC

Max Geisler of Barnegat, NJ, scratch-built this 68-inch-span, 8-pound Ryan Navion, which he flies at the Pine Barren flying field in south Jersey. Powered by an ASP .61 and controlled by a 6-channel Airtronics radio, it has a sliding canopy and operating flaps and is covered with Ultracote.

1941 PUSHER

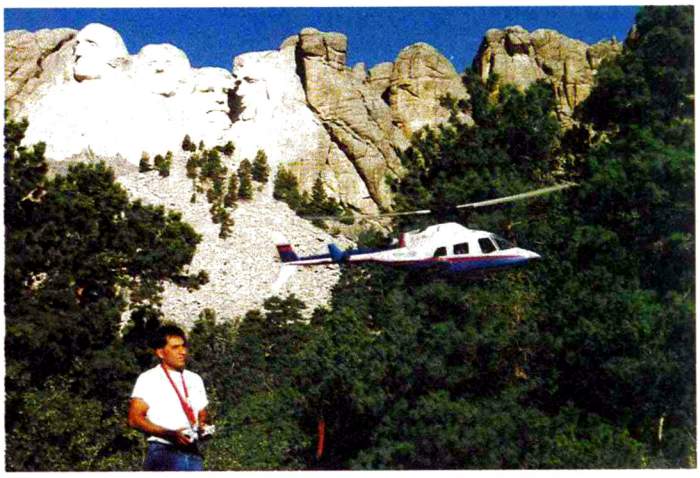


Larry Katz of Toms River, NJ, sent us this photo of his scratch-built 1941 B. Gross Flying Wing. The model uses both rudder and ailerons for control, and it's powered by a .09 engine. To create the bright color scheme, Larry used both MonoKote and Ultracote. Larry has been building and flying R/C model airplanes for 50 years and says, "What a beautiful trip it has been."



BEAUTIFUL BULLDOG

This 96-inch-span, 38-pound, true-to-scale Hall's Springfield Bulldog is the handiwork of Enrique Toscano, who lives in Monterrey, Mexico. He used Hobby Poxy and K&B paint over silk for the finish, and he powers the model with an A&M 2-stroke 4.2ci engine. Enrique's Bulldog flies over the Asociacion Regiomontana del Aereomodelismo field in Mexico.



PRESIDENTIAL 'COPTER

Adam DeLeon of Rapid City, SD, sent this striking photo of his 12-pound Bell 222 X-Cell 60 flying near Mt. Rushmore. Powered by an O.S. .61-SX and controlled by a JR Century VII radio, the heli also has air retracts. Adam, a member of the U.S. Air Force, says that the Bell 222 is a "really smooth flying machine!"

(Continued on page 28)

Pilot **PROJECTS**

ITALIAN FIGHTER

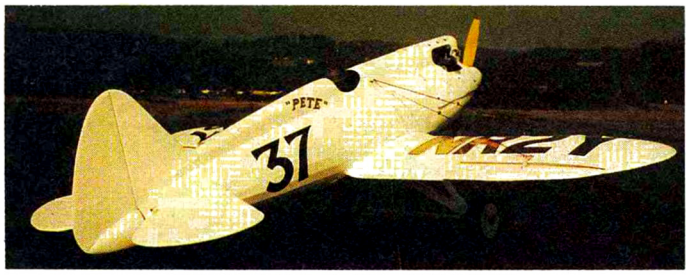
Ennio Melica of Sesto S. Giovanni, Italy, scratch-built this Fiat CR 32. The 10-pound model has a 55-inch wingspan and is powered by a Saito FA 80 engine. The full-size Fiat was built in 1930 and was the first plane used by the Italian aerobatic team. It was also used during the Spanish Civil War and by the Italian army during the WW II African campaign in Ethiopia. Ennio's son-in-law, Pailo Perego of Miami, FL, sent us this photo.

BOMBER-CREW TRAINER

This unusual AT-11 Kansas was scratch-built by John M. Smith of Penndel, PA, from modified Nick Ziroli D-18 plans. Twin Q-42s power the WW II model, which has a one-piece, plastic nose bubble for the "miniature" student bombardier. John says that the model "purrs in the sky and is easy to fly."

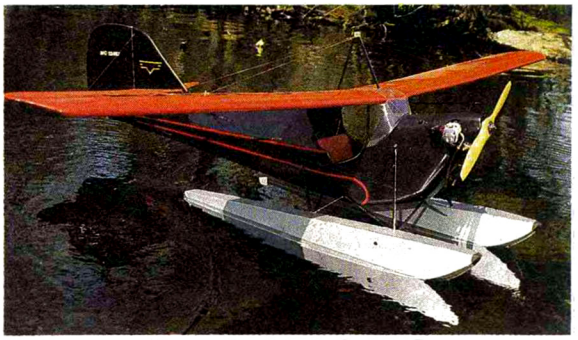
HOORAY FOR HOLLYWOOD!

Ted Carl of Wyzata, MN, built this Fokker Dr.I from a Proctor-VK kit and covered it with 21st Century fabric. He duplicated the "Hollywood collage" color scheme from the barn-storming plane in the Robert Redford movie, "The Great Waldo Pepper." Ted has a flying fleet of five planes and says that although the model has been "on deck" for more than a year, he "builds 'em to fly" and can't wait to take it out to the field.



FOR PETE'S SAKE!

Guy Larson of Camas, WA, scratch-built this 1/5-scale Howard DGA-3 Pete model from his own plans. The 50-inch-span plane is powered by an O.S. .48 Surpass and is covered with Coverite's 21st Century fabric. Guy says, "The model flies great; Benny Howard would be proud." Nice job, Guy; we agree.



C-3 ON FLOATS

Built by retired airline pilot Bill Harwood, this 1/4-scale model is an exact copy of designer Jean Toche's full-size C-3, which Bill is now restoring. An O.S. Gemini 4-stroke powers the model, and a 4-channel Airtronics PCM radio controls it. *Model Airplane News* contributor Frank Gudaitis took the photo.

FLYING DUTCHMAN

Jan Leeuwestein sent this photo taken at a "big scale scene" in the Netherlands. Ron Ton modified the Corsair from a Byron kit and equipped it with landing lights and a sliding canopy that's connected to the flap mechanism. A 5-stroke O.S. radial engine powers the 30-pound model through the sky.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

GLOBAL QUALITY KITS

Tecate

by MIKE DeHOYOS and ROGER POST Sr.

WHEN YOU GRADUATE from trainers, you'll be ready for something that will make your head spin—the Tecate (Te-ca'-tee) biplane! The second in the Deluxe Series of kits from Global*, the Tecate does aerobatics and lands as gently as a trainer. What's more, it can be built quickly and doesn't require a tricky jig for parts alignment.

One hot tamale!

To build this project, I teamed up with my flying buddy Roger Post Sr., who covered the model and installed the radio. When we show up at the field with this one, I think our efforts will make the guys envious. Let's get to work.

CONSTRUCTION

As always, read the manual first; it is well-written and to the point. On the second page is a list of necessary tools and also the parts list, which you'll need to identify the components for construction. Before you glue anything together, trial-fit the parts and check their positions against the plans and photos.

• **Fin.** This is made with 1/4-inch die-cut pieces, and the rudder is die-cut out of one piece of 1/4-inch-thick balsa. Recess the two, 1/64-inch-thick, die-cut plywood doublers for the rudder control horn into the rudder. The stab is almost the same as the fin, but it is sheeted with balsa when the frame is complete. The elevator halves are connected by a spruce dowel.

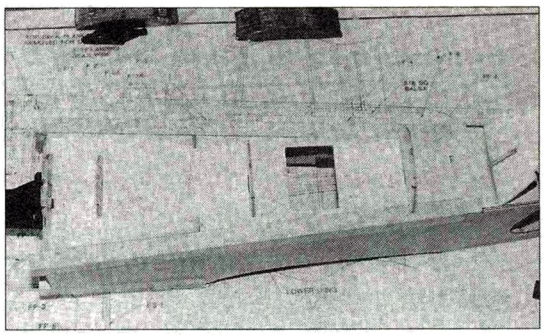
• **Fuselage.** Interlocking plywood pieces make a strong fuselage that will take any of the wild maneuvers you're competent to put it through—especially hard landings. In some of the earlier kits, the FP-3 plywood doubler was too large. Global has now corrected this, but if you encounter the problem, you can either position the doubler, mark the correct line and trim it, or you can glue it into place and trim it after the glue has dried.

When assembling the two firewall pieces, be sure the two halves are aligned perfectly. Care-fully review the instructions for installing the blind nuts. When you're looking at the *front* of the firewall, the motor-mount holes should have the two holes that are farthest apart vertically on the left side. Some early kits had "B-1" stamped on the wrong side of the firewall pieces, so be careful when

The Tecate does aerobatics and lands as gently as a trainer. What's more, it can be built quickly and doesn't require a tricky jig for parts alignment.

you install the blind nuts—just in case. In the section on fuselage construction, Photo 13 shows the back of the firewall. When you install the firewall, you have to cut a notch in FP-1 so that it will accept the upper right firewall blind nut. This will ensure a tight fit when assembling.

I installed the sheeting for the turtle deck before I glued the 7/16-inch square top stringer into place. This provided a cleaner joint and was easier than cutting the balsa sheeting to the correct size.



The Tecate's rugged fuselage construction is evident here. The plywood sides and top and the balsa blocks make a fuselage that will endure any hard landing.

SPECIFICATIONS

Manufacturer: Global Quality Kits

Type: sport biplane

Wingspans: 50 in. (top wing), 44 in. (bottom wing)

Length: 47.5 in.

Wing area: 690 sq. in.

Weight: 6 lb., 13oz.

Wing loading: 22.75 oz./sq. ft.

Airfoil: semisymmetrical inboard; transitions to flat-bottom toward tips.

Washout built in?: yes

Engine rec: .40 to .53 2-stroke

Engine used: Magnum* .46

Prop used: Master Airscrew* Scimitar Profile 10x6

Radio req'd: 4-channel (throttle, rudder, elevator, aileron)

Radio used: JR 388S with an 1100mAh battery pack and 5 servos (NES-4000—rudder; two NES-4131s—throttle and elevator; two NES-9021s—ailerons). An NEB-480 Model Beacon is also used.

Recommended throws: aileron—3/8 in. up and down; elevator—3/4 in. up and down; rudder—1 in. right and left.

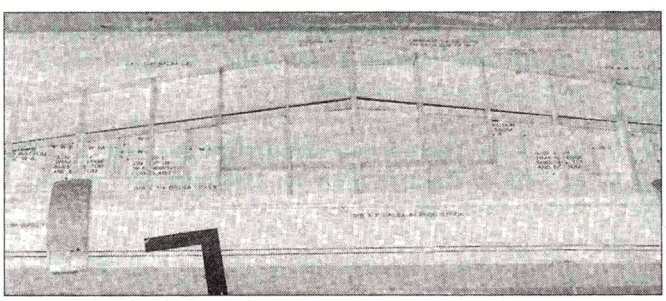
List price: $119.99

Features: ultra-precision-cut plywood and balsa parts; complete hardware package; spinner; molded canopy; motor mount; molded cowl; pre-formed landing gear; tail-gear strut; tires; wheel pants; fuel tank; formed-aluminum cabane struts; official Tecate decals; photo-illustrated instruction manual; two sets of rolled, full-size plans.

Hits
- Excellent looks.
- Easy construction.
- Fiberglass cowl (primed).
- Great flight characteristics; great aerobatics with docile landing qualities.

Misses
- One mis-marked part and one oversize part—corrected in newer kits.

• **Cowl and wheel pants.** The fiberglass cowl comes primed, so all you have to do is cut out the necessary holes and paint it (nice touch). The injection-molded wheel pants need a little sanding and should then be trial-fitted into place. Secure the wheel pants with a no. 888 Sullivan* mounting bracket.

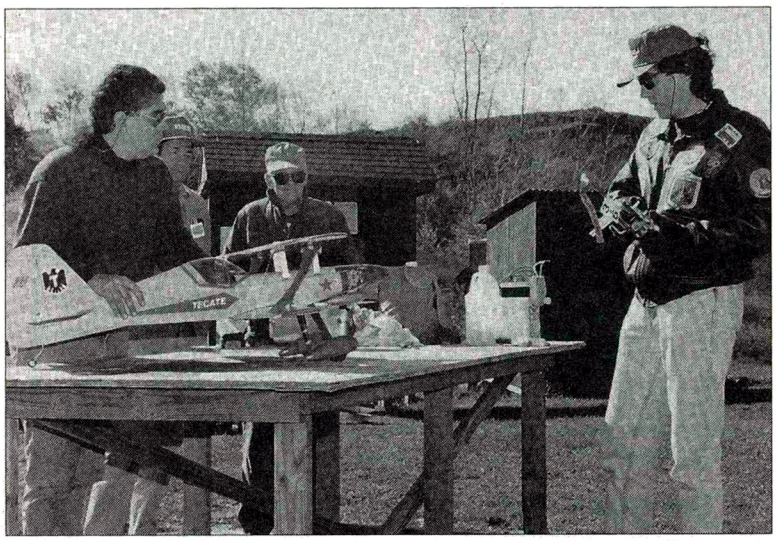


The bottom wing in the inverted position. The spruce spars increase the strength of the wing's structure.

• **Wing.** Assembling the bottom wing took 3 hours; the spruce spars increase its strength considerably. I added a pair of 3/8x1/4-inch balsa rails to each side of the center rib so I could use two aileron servos.

The top wing is as easy to make as the bottom one, but it takes a little more work. To ensure a proper fit and avoid having to trim the top wing-mounting block later, trial-fit the block when you build the center section. I also found it necessary to drill riblets W-4A and W-5A before installing them in the wings.

Attaching the wings and the cabane struts is simple and straightforward. *Caution:* do not install the fuel tank until you have completed all of the drilling! If you drill in too far, you may have to buy a new tank. Now I'll let Roger Sr. take over.



As always, a test flight is a group effort (left to right): Mike DeHoyos, Bill Masetti and Jack Hayek assist Roger Post Jr. in the preflight activities.

• **Radio.** To make the servos fit, you must carve some material away from the stringers that support the turtle deck. I turned the middle servo around so that the servo arms do not interfere with each other when they are fully deflected (manual shows this installation). Run the servo

TECATE

by ROGER POST JR.

When I first saw this beauty, I immediately thought: "This will be a real performer." Now that I've flown it, I can tell you that I in fact underestimated it; this plane can really "cook." As soon as my Dad had finished his usual expert covering job, I flew the Tecate around. This is a preliminary report.

FLIGHT PERFORMANCE

• Takeoff and landing

As usual at our field, there was a 10-knot crosswind, but this didn't affect the Tecate's takeoffs or landings. During takeoff and climb-out, the sub-fin and large rudder helped to reduce the need for more right rudder. With its almost 7 pounds of weight, the Tecate definitely needs reliable power and a propeller that provides good thrust. For the second flight, I changed to an 11x4 APC prop, and performance improved greatly. The ailerons and elevator have plenty of clout, so be sure that your radio is properly dialed with some expo and dual rates. If you don't have a computer radio, use the throws given here in the Specifications chart. The rudder was set up with a lot of throw—very useful for aerobatics and crosswind landings.

Landing the Tecate is very basic. Lower the nose a little and line up with the runway; let it glide to the runway threshold and flare just before touchdown. Because of the design of its airfoil, the Tecate is extremely stable in the landing setup, and it doesn't show any tip-stalling tendencies. If you have a strong headwind or crosswind, keep some power in and use the nose-low attitude for your approach.

• High-speed performance

The Tecate is fast, so make sure that your thumbs are able to handle its speed. Whether at full throttle or a little above ¼ throttle, the Tecate's thin, sleek design allows it to cut through the air with the greatest of ease. The power-on stall is straight ahead; just let go of the stick, and it will start to fly again. It will fall off only if it's hit by a gust of wind from the side. Again, the elevator and ailerons really are effective, so be sure that you can handle what you have set up.

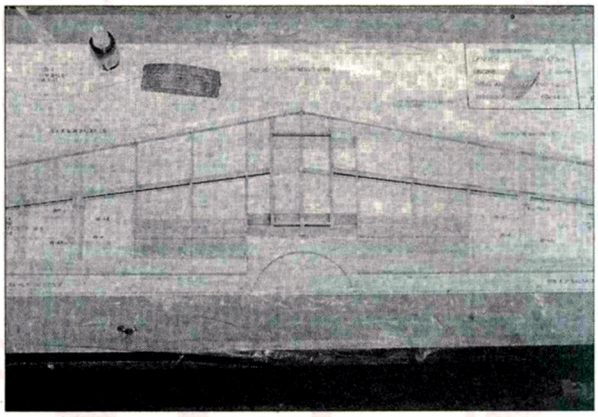
• Low-speed performance

With its semisymmetrical to flat-bottom (near the tips) airfoil, the Tecate can fly very slowly and remain rock solid. This is an excellent trait because if you blast off and are in over your head, you can always throttle back and regain control. I found the rudder very effective at the slower air speed; the ailerons do remain effective, but you just have to use a little more stick movement to keep them effective. Power-off stalls result in an easy drop-off; all you have to do is add throttle and start flying again. If your engine sags when you add power, keep a level or slightly nose-down attitude to maintain flying speed.

• Aerobatics

If you love snap rolls, here's your plane; it snap rolls beautifully. both left and right. I had to adjust the differential that I had set on the ailerons to achieve a better axial roll. After that, the axial rolls were greatly improved. With everything on high rates, loops, rolls and spins were easy to do. When pulling up for the loop, I added some right rudder to keep it tracking straight. To remain level in inverted flight, you have to apply a little forward stick.

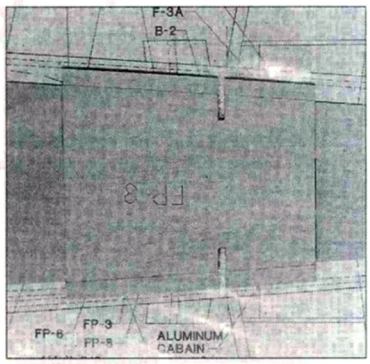
The Tecate will easily do any complicated maneuvers. Knife-edge flight needed only a little rudder to maintain attitude; Lomcevaks, avalanches, flats spins, knife-edge circles (in or out), rolling circles, torque rolls, etc., are all easy to do; they require only a slight adjustment of the control surface throw and the knowledge of your thumbs. Throughout the test flights, the Magnum .46XL and the JR 388S performed beautifully. The Tecate is an excellent, stable flier that has tremendous aerobatic capabilities, and I highly recommend that you try one out.



When you build the top wing, be sure to trial-fit the wing-mounting block when you construct the center section. By doing this, you'll avoid having to trim the block later on, when you fit the wings to the fuselage.

wires to one side, and let them exit through the gap between the servo and the plywood mount. Wrap the receiver battery in foam and install it behind the fuel tank, then mount the switch on the left side of the plane. I bubble-wrapped the receiver and mounted it on the side of the fuse with Velcro®-brand fastener. I mounted a JR* NEB-480 alarm/locater beacon in the cockpit, where it simulates a pilot headrest.

• **Finishing and covering.** I filled the airframe with Great Planes* balsa filler and sanded it smooth. I cut the hinge slots with a Du-Bro* EZ trimmer and no. 19 X-Acto blades and used and Du-Bro CA hinges throughout. I used a 21st Century* covering iron to cover the Tecate with Top Flite* MonoKote—Cub Yellow and red. The exposed wood was painted with Pactra* Stearman Red and Cub Yellow. I painted the cowl and wheel pants with 21st Century red, and I used a Roland* Stika Intelligent Cutting Machine and Coverite* graphics trim sheets to make some of the graphics. I also used the supplied Tecate logo graphics. Global and Du-Bro hardware was used throughout.



If you happen to have an oversize FP-3, just trim it as described in the article.

• **Balancing.** The Tecate can be balanced ¾ inch farther aft than the plans indicate. I used a Harry Higley* brass prop nut to help balance the plane.

Overall, the Tecate is excellent; it's straightforward and easy to build, so if you're ready for a biplane, stop right here, because your search is over.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

MODEL AIRPLANE NEWS

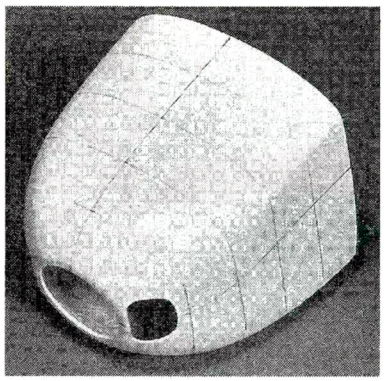
HOW TO

Custom-fitting for improved appearance

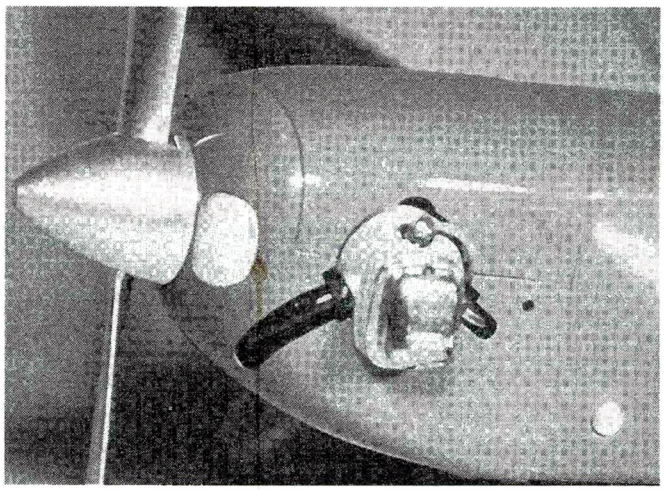
Preformed Cowls

by FAYE STILLEY

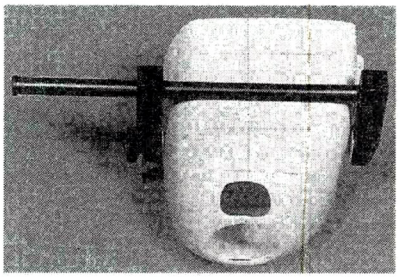
HOW OFTEN have you seen an otherwise beautiful airplane ruined by a big hole hacked out of the cowl?—too often, but it doesn't have to be that way. It's true that preformed cowls are made to fit the airplane, not the engine. Unless your engine and muffler fit entirely within the cowl, some "customizing" will have to be done. Here is a way to do it so that the cowl fits the engine as well as the airplane. Try it; you'll have a great-looking model and have the guys wondering how you did it.



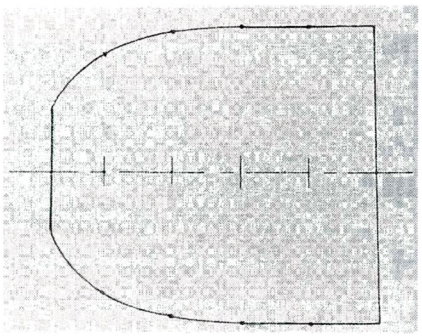
1 This cowl is fairly typical of one that would come with a kit. This particular cowl came with an almost-ready-to-cover (ARC) kit. No full-size drawing or set of plans was included. This made the task a little more difficult; I had to prepare a scale drawing so that I could calculate the positions and sizes of the required engine openings.



The first step toward preparing a scale drawing is to determine the true shape and size of the cowl. Draw reference lines on the cowl. You'll need a center line, a thrust line and cross-section lines. The number of cross-section lines needed is dictated by the complexity of the shape. This cowl is fairly simple, so only five cross-section lines are needed. They are drawn 3/4 inch apart.

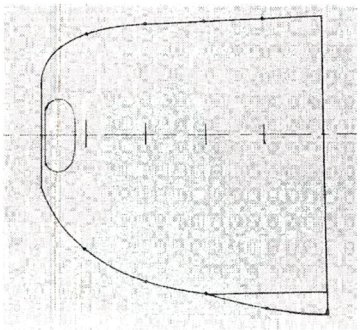


2 The reference lines enable you to take accurate measurements. Calipers make the task easy, but if you don't have a set, you can use a C-clamp like the one shown here. Take the measurements one by one and record them. The cowl's length can usually be measured by putting it on a flat surface and inserting a ruler into the prop-shaft hole. The cowl's width is measured at the firewall, the spinner and at each of the five cross-section lines. For the top view of the cowl, only a single measurement was necessary at each cross-section. Because the sides of the cowl are symmetrical, the total width may be halved to determine the distance from the center line for each cross-section.

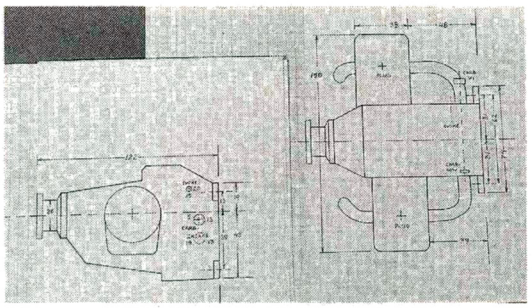


PHOTOS BY FAYE STILLEY

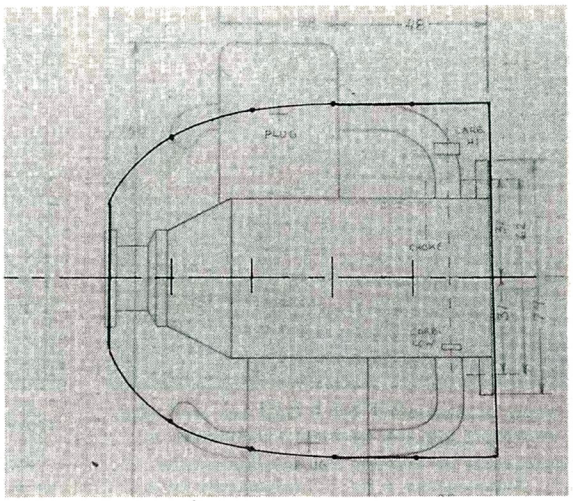
3 Draw the center line and mark the firewall and spinner widths on tracing paper. Following the measurements you took in step 2, make dots along the outer edge of the cross-section lines. Then connect the dots to form the outline of the cowl's top view. French curves help to keep the curved areas uniform.



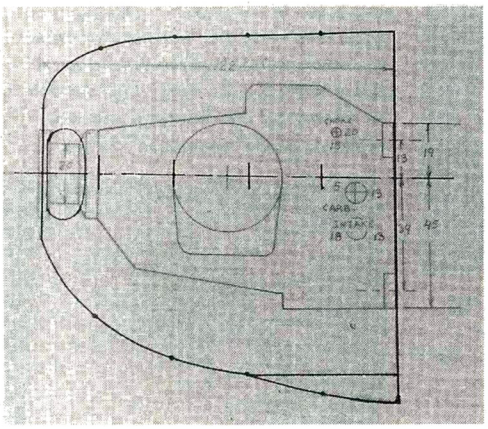
4 The side-view drawing is made in the same way as the top view, but the measurements must be taken differently. The reference line for the side view is the thrust line. The side's shape is not symmetrical, i.e., unlike the top view, the distances from the reference line to the top and to the bottom are not equal. When you take the measurements for the side view, take two measurements at each cross-section: the distance from the thrust line to the top as well as to the bottom. The same is true for the height at the firewall. The spinner height will usually be centered at the thrust line.



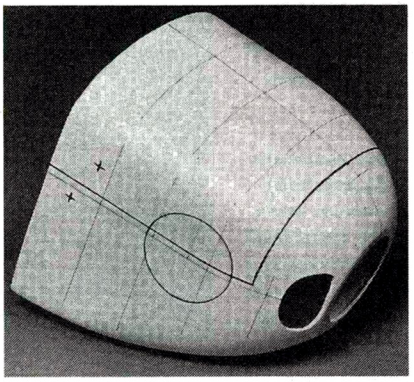
5 *If you have plans for the kit you're building, you already have a scale drawing of the cowl; simply copy it onto tracing paper. The preceding steps aren't necessary; you do, however, need scale drawings of the top view and side view of the engine you plan to use. I had these drawings left after a previous project. As you can see, the engine drawings need not be detailed, but the measurements must be accurate. The reason will become obvious in the next step.*



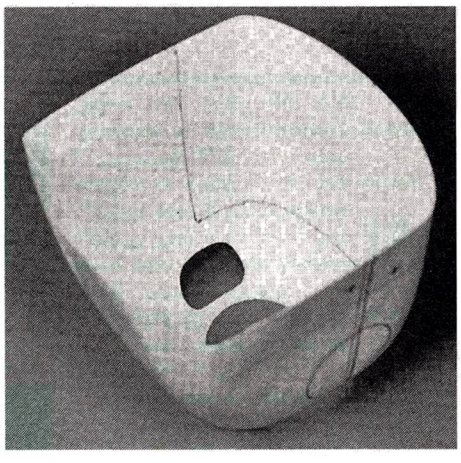
6 *Placing the tracing-paper drawing of the cowl over the engine drawing provides you with an x-ray view of how the engine will be positioned inside the cowl. You can see where openings will have to be made to allow engine and/or muffler parts to protrude from the cowl.*



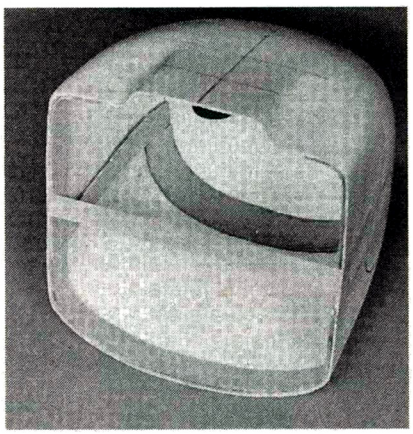
7 *The x-ray view from the side provides another perspective. You can now see where access holes will have to be made to allow you to adjust the engine from outside the cowl. Using this x-ray drawing technique helps you to avoid many potential problems. Many decisions can be made now, before a single scratch is made in that expensive preformed cowl. For instance, if the plug will be covered by the cowl, do you want to make a hole for the plug driver or make a remote connection? If your engine has a choke arm, will it have to be modified to make it operable from outside the cowl? If your engine does not have a choke, how will you prime or choke it? Do you want to be able to adjust the low-speed carburetor control from outside the cowl, or will the high-speed adjustment be adequate? Can the cowl be put on after the muffler has been installed, or must the muffler be put on from outside the cowl? Are special access holes necessary? These are just some of the questions to be considered before you start the actual fitting. Others will arise, e.g., fuel delivery and defueling, tank pressure, engine and cowl mounts, crankcase breather tubes, exhaust stacks, etc.*



8 *One last planning step before you start chopping things up: decide where the cowl separation line will be. Unlike this one, most cowls do not have big cooling holes this close to the prop-shaft opening, and they can simply be cut into halves either on the thrust line or on the center line. Because this cowl has large openings close to the spinner and an unusually large hole for the prop shaft, I decided to make the separation line stop behind the vent holes and go over the top of cowl. On your cowl, draw the separation line and any other necessary reference marks. The circle on this cowl is the minimum area that must be removed to allow clearance for the cylinders. The center marks for the access holes have also been made.*

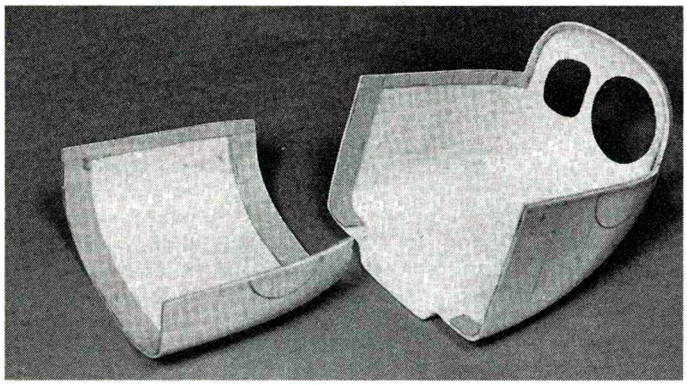


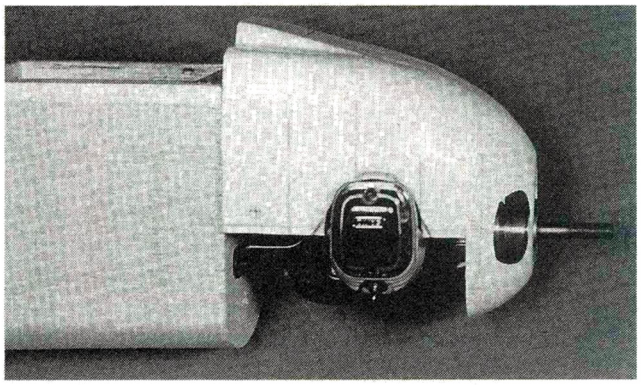
9 *The separation line should be drawn with dark ink, and it should be bold enough to be visible through the cowl material. Hold the cowl up to a light, and trace the separation line onto its inner surface. This will facilitate the next step.*



10 *Here, 1/2-inch strips of plywood have been glued over the separation lines. This will leave a 1/4-inch frame around the openings on both the upper and lower sections of the cowl after it has been cut apart. Because we are working with a preformed cowl, this process is sort of backward compared with a logical building sequence. It's like building a frame inside the hood of your car after the hood has been attached to the car. I used two layers of 1/32-inch plywood because it's easy to curve, and when it's finished, it will have the strength of 6-ply, 1/16-inch plywood. This is a small cowl (.40 size); a larger cowl should have a larger, thicker frame. The tape across the rear opening holds the cowl in the correct shape while the glue is drying.*

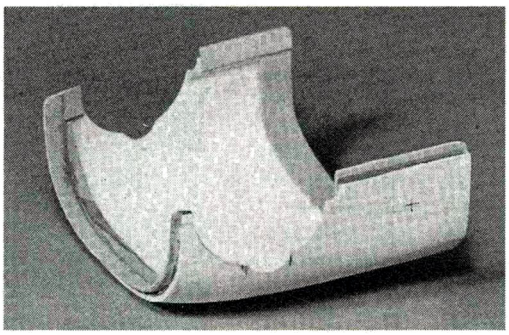
PREFORMED COWLS



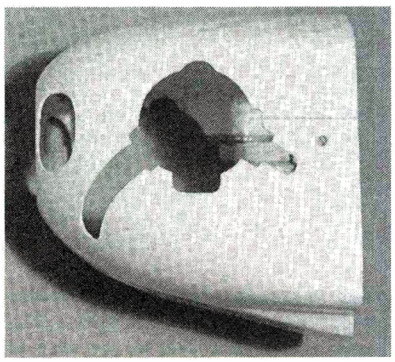


11 *Cut the cowl along the separation line. A razor saw works best for this because it has a very thin kerf and a wide blade. A wide blade helps you to cut straight. You could use a fine-tooth hacksaw, but it doesn't provide the guidance of the wider blade. Note that the wooden frame increases the cowl's rigidity so that it holds its shape. It also strengthens the firewall opening and helps to prevent it from cracking if you use screws to mount the cowl.*

12 *The cylinder openings have been partially shaped. The section drawn on the cowl has been removed. From here on, only a little material will be removed at a time to avoid making an opening that's too large; remove only enough material to allow for vibration and avoid heat damage. Several fittings will be required to ensure that the cowl will eventually fit the engine perfectly. I use metal files to do this fine shaping. When the lower section and the engine are in place, tack-glue the lower cowl section to the firewall so that they stay aligned while you fit the upper cowl section.*



13 *Fit the upper cowl section in the same way as you fit the lower section. Finally, add a lip of 1/16-inch plywood to the sides, making it extend 3/16 inch beyond the mating edge. It slides inside the lower cowl section and holds the two parts securely in alignment. Add another plywood lip around the forward edge of the upper cowl, extending it about 1/8 inch beyond the forward edge. It has the same function as the side pieces: it holds and locks the upper cowl section to the lower section when they're attached to the firewall. Because of the pronounced curve, it's easier to laminate two thin pieces of plywood for the forward lip.*



14 *The joined halves almost look like one unit; the separation line is straight, thin and hardly visible. The line would be even less visible on a dark cowl. The two halves of the openings on the separation line match; there are no ragged edges; and no round things will stick out of square holes (or vice versa). To increase strength, epoxy a layer of light fiberglass to the inside of the cowl sections.*

Left: the Soviet-made SU-26 Sukhoi is powered by a 360hp, 9-cylinder, Vedenyev M-14P radial engine. It was the first unlimited "acrobat" to have a true, supine, pilot seat that allows the pilot to endure G-forces. Right: the SU-29 two-place Sukhoi.

A new crop of amazing machines

THE Acrobats

by BUDD DAVISSON

The Extra 300s. The Extras, especially the new 300L, might be considered the Mercedes-Benz of the unlimited line of aerobatic airplanes.

Pictured top to bottom: the Edge 540 is powered b a Monte Barrett-built Lycoming. (Photo by Bud Davisson/EAA Sport Aviation, March 1995.) ■ The Rih One Design—a back-to-basics aerobat that has a woode wing attached to a fabric-covered steel-tube fuselage (Photo by Budd Davisson.) ■ The Giles G-200 is unique i that it is made completely of composite, fuselage and al Contrary to the popular notion, the G-200 was no inspired by the One Design. Its lightness and 200h engine put it in the "rocket" class. (Photo by Jir Koepnick.) ■ The Pitts Super Stinker is a tried-and-tru Pitts design with wooden, fabric-covered wings and steel-tube fuselage. It's a blast to fly and has all the pe formance of the slicker monoplanes.

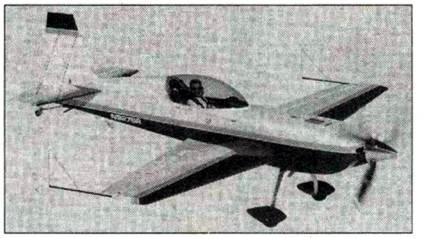
FOR YEARS, serious full-scale acro pilots hung around R/C fields watching pattern ships flit about the sky like purple martins snacking on a sea of unseen insects. To full-scale pilots, the roll rates and power loadings of the better R/C birds were magical and unobtainable in the real world—but no more.

TURNING THE TABLES

In the past three or four years, a bumper crop of full-scale acro birds has burst on the scene, and they may just turn the tables and leave the R/C crowd scratching their heads. These airplanes are absolutely rewriting the rules in aerobatics and establishing new standards, which were totally inconceivable only five years ago.

When the 180hp, round-wing Pitts Special set a new standard in the very early 1970s, a roll rate of 200 degrees per second was mind-boggling. Ditto a climb rate of 2,500 feet per minute. Today, all of the serious acro specials roll at twice that and roar uphill at 4,000 feet per minute without breaking a sweat.

Numbers like 400 degrees per second don't mean anything until you've seen them from the cockpit. Take my word for it: they are positively numbing! Plus, the roll rates are coupled with such rapid acceleration in roll that the airplane acts as if it is just waiting, ready to pounce as soon as the pilot nibbles at aileron. The instant the stick is touched, the airplane reacts.



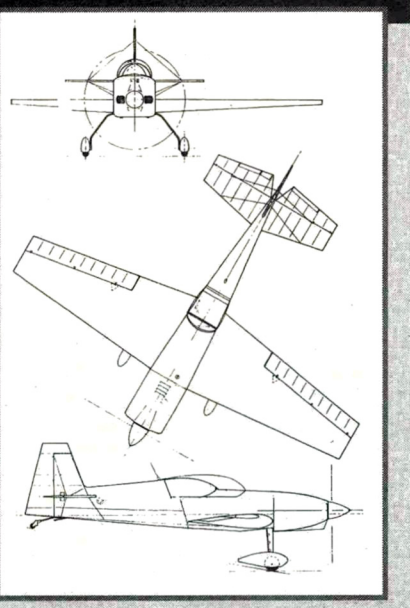
The Staudacher S300—limited production, one-at-at-time designs that follow the successful Staudacher formula: a 6-cylinder 300hp Lycoming engine attached to a midwing monoplane.

SLICK MONOS

The wild increase in performance is coupled with a similar increase in overall strength and aerodynamic cleanliness, courtesy of composite construction. In all but a few cases, the aircraft use some sort of space-age composite, usually graphite and Kevlar, for the wings. This gives incredible strength at a relatively light weight, and the surfaces are as slick as glass. Literally!

With the sole exception of the Pitts Super Stinker, all of the new airplanes are super-clean monoplanes. When Leo Loudenslager single-handedly changed the face of competition aerobatics by breaking the American biplane tradition and repeatedly winning the national crown with his Laser 200, he wrote the future on the wall in great big letters. Those letters spelled "monoplane." And

STAUDACHER S300/600



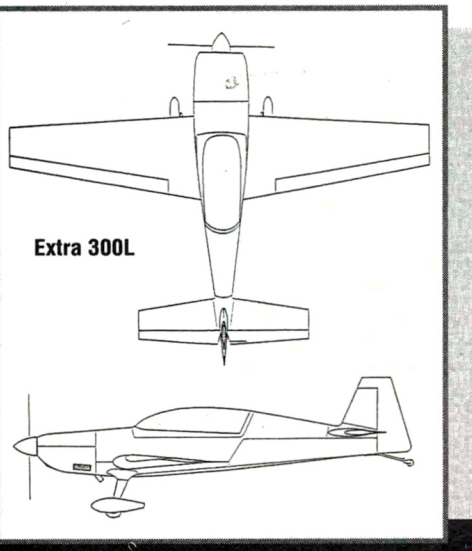
The Staudacher airplanes are limited-production, one-at-a-time designs that have been nibbling away at the leaders for the last five years. Because they are custom-built, they differ with regard to the type of engine and propeller used, but they all adhere to the Staudacher formula of having a 6-cylinder, 300hp Lycoming attached to a midwing monoplane.

SPECIFICATIONS

Wingspan: 25 feet, 4 inches
Length: 21 feet, 9½ inches
Horsepower: 300
Rate of climb: 3,400 feet per minute

Staudacher structures are a little different because the wings are made entirely of wood, but the spar caps for the built-up box spars are sandwiches of spruce and carbon fiber. The wing is covered with wood but has a cosmetic fiberglass cover. The rest of the airframe—including the fabric-covered tail surfaces—is steel tube. The new, lightweight Staudacher is the S300D, while the two-place version is the S600.

EXTRA 300S AND 300L



The Extras, especially the two-place 300L, might be considered the Mercedes of the unlimited line of aerobatic airplanes. Probably no flying machines of any kind show better craftsmanship or are more comfortable. They also go like stink! With Patty Wagstaff and Phil Knight at the controls, they won the U.S. National Championship for the last five years.

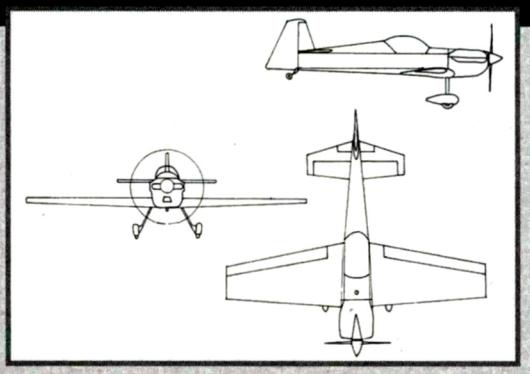
SPECIFICATIONS

EXTRA 300L
Wingspan: 25.25 feet
Length: 22.83 feet
Horsepower: 300
Rate of climb: 3,200 feet per minute

The latest airplane, the two-place 300L, is something of an anomaly because most experts think it flies and performs at least as well as the single-place 300S. Originally designed as a replacement for the midwing, two-place Extra 300, the 300L is only minimally different: lower wing, shorter fuselage and a few other seemingly minor changes. Even its designer, Walter Extra, isn't sure why it is such a great performer.

In the cockpit, the airplane feels electric-smooth in every possible way. There is little or no vibration, and the controls are beautifully harmonized. Just flying around, you'd think you were in a corporate-style airplane. But slam the stick to the side, and hold on to your hat! Few, if any, airplanes roll faster, or hold a vertical line better than the Extras. They're airplanes in which you immediately feel at home; "user-friendly" might be a way of describing them.

AVIONS MUDRY CAP 232



That the people at France-based Mudry were willing to take a chance and mess with their 1994 World Champion design—the CAP 231—to come up with a new one shows how intense competition at that level can be. Neither pilots nor designers can rest on their laurels.

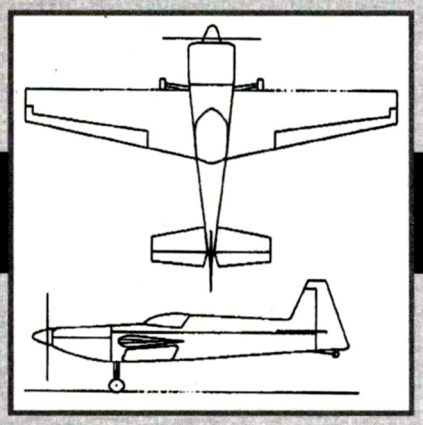
The CAP series of aircraft descended from the home-built Emeraude; one of Mudry's first certified aircraft was the CAP 10—the two-place aerobatic trainer made famous by the French Connection formation aerobatic team. But when the company decided to take a crack at the unlimited category, they had to leave their dependency on wooden construction behind and take a step into the space age. As with most of the others in the series, the CAP's structure uses lots of pre-preg carbon fiber that has been pressure-cured in Mudry's own autoclave.

SPECIFICATIONS
Wingspan: 24.3 feet
Length: 22.2 feet
Horsepower: 300
Rate of climb: 3,290 feet per minute

As with all the other acrobats, its cleanliness and high power give it a cruise speed of 200mph, but new airfoil technology brings its stall speed down to 65mph. The slow-speed handling of almost all of the new breed is aimed at letting the airplane nibble down to within a few knots of stall while still being totally controllable. That's why airplanes such as the CAP 232 look as if they come completely to a stop at the top of some maneuvers but can still push over and fly away: the wing is still flying, and all that wind being generated by the prop lets it work well at below normal stall speed.

EDGE 540

The Edge is a relatively new entrant in the field. Built and designed by Bill and Judy Zivko of Guthrie, OK, it could almost be considered a backyard, small-business prodigy. Zivko Aviation is a relatively small company that specializes in building high-tech composite parts for



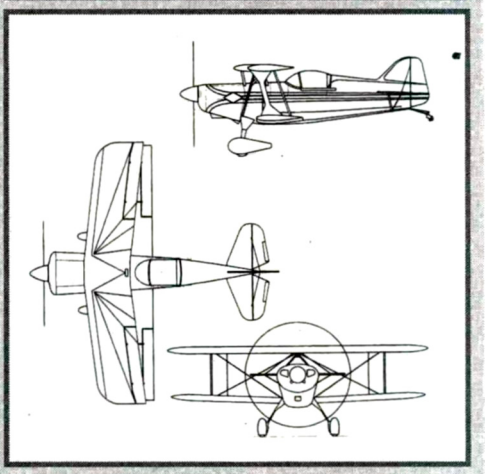
SPECIFICATIONS
Wingspan: 24 feet, 4 inches
Length: 20 feet, 7 inches
Horsepower: 327
Rate of climb: 3,700 feet per minute

industry. They started by building composite replacement wings for Lasers and eventually designed their own airplane.

Most Edges are equipped with a Monte Barrett-built Lycoming, which is another way of saying that when you move the throttle forward, you are poking around 330hp in the rear—and you can tell it! As the airplane claws its way upstairs, the controls are so quick and light that you aren't even conscious of them being in your hand. Their pressure gradient is very flat: they feel the same no matter how much you deflect them. And they don't change as speed changes.

Zivko had noted aerodynamicist John Roncz come up with a special airfoil for the airplane, and it really works at the lower ends of the speed range. Even at the top of verticals, the airplane lets you push and prod without it doing anything stupid.

PITTS SUPER STINKER



Curtis Pitts had considered hanging up his designer hat, but he thought better of it when he saw how expensive unlimited competition was becoming. Dusting off his drafting board (he hates computers), he laid out a new Pitts Special for a 6-cylinder, 300hp engine that he designed to take on the Extras and Sukhois, but at a fraction of the cost.

The airplane is tried-and-true Pitts—wooden structure, rag-covered wings and steel-tube fuselage. That's what makes it so easy for the homebuilder (or overactive modeler) to build from scratch. Working in his garage, a builder could finish the airplane for $30,000 to $35,000—including engine. Such a deal!

SPECIFICATIONS
Wingspans: 18 feet (top wing); 17 feet, 6 inches (bottom wing)
Length: 17 feet, 6 inches
Horsepower: 250
Rate of climb: 3,300+ feet per minute

The airplane is an absolute blast to fly! It has all the performance of the slicker monoplanes, but has one advantage that's important to lots of us: the extra wing! Some folks just like biplanes. Unfortunately, judges are not among those folks. In world competition, biplanes are traditionally downgraded just because they're biplanes. Don't ask. We don't know why.

One real performance advantage of the Super Stinker is an ability, when flying slowly, to regain altitude and energy almost immediately because it is so light and has so little inertia.

the U.S. was quick to learn what that meant.

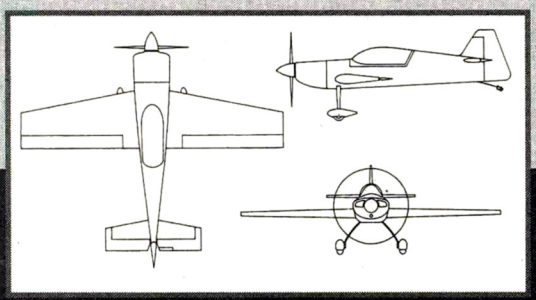
The Europeans had been flying monoplanes since international-level aerobatic competitions began in 1960. Their Zlins and Yaks regularly ate our lunch until the Pitts Special put an end to that in 1971. But their monoplanes were big airplanes in need of more serious horsepower. Leo showed what could be done with a smaller airplane and a medium-size engine, and midwing monoplanes, such as the Laser, became the standard.

Everything we consider a modern, aerobatic airplane can trace its roots, in one way or another, back to Leo and his Laser, whether they want to admit it or not.

Composites brought massive strength-to-weight ratios that allowed the construction of wings and tails that could withstand loadings in excess of 20 Gs! Then the propeller manufacturers responded to a need for lighter props with higher thrust, and composites worked their way into that industry as well.

The lighter props, stronger airframes and crazier pilots have given rise to entirely new forms of maneuvers that, as much as anything else, are based on gyroscopic tumbles. The new pilots have

GILES G-200



The G-200 is unique in that it is made completely of composite—fuselage and all—and, regardless of what a lot of folks think, it was not inspired by the One Design. The two airplanes developed along separate paths.

The G-200 was designed with the goal of building the highest performance, 4-cylinder airplane possible. The engine is a 200hp Lycoming that swings a composite MT prop, and the airplane weighs only 750 pounds empty! That's even lighter than most single-hole Pitts Specials, and that's why it has a power-to-weight ratio of 5.0 lb./hp. This puts it in the rocket class!

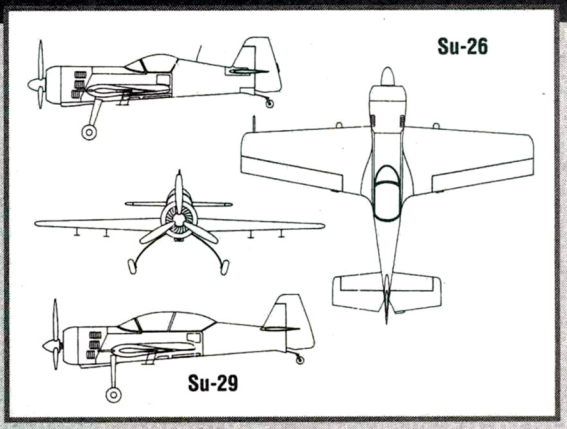
SPECIFICATIONS
Wingspan: 22 feet
Length: 19.75 feet
Horsepower: 200
Rate of climb: 2,500 feet per minute

The seating is at a true 45-degree supine position, which, on the ground, has you lying back at nearly 60 degrees with your feet at shoulder level. It makes you feel like an Apollo astronaut.

In the air, you don't notice the seating position, but you *do* notice how easy it is to put more G than you're used to on this airplane because your body doesn't feel it as much as usual. Everything about the airplane happens quickly. Everything! The roll rate may well be the fastest in the propeller-driven world; the manufacturer says it has been timed at an amazing 500 degrees per second. You couldn't prove that by use, because our eyeballs get G-lock at anything past 350 degrees per second. Anything more is just a blur.

This is one of the few airplanes out there that is so transparent that, from the pilot's point of view, it has little personality of its own. But the flying personality of the pilot will be readily apparent; the plane won't cover up for sloppy flying.

SUKHOI 26/29/31



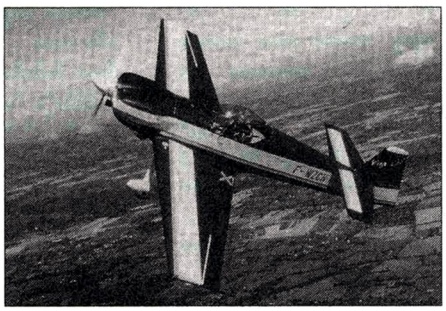
The Sukhoi aerobatic aircraft are some of the very best results of *glasnost* because they have been kicking butts since their introduction in 1984. Their relatively exotic appearance and blazing performance have made them so well-known that they hardly need to be described.

Whereas most aerobatic aircraft are designed by private individuals for private sale, the Su-26 and its brethren, the two-place Su-29 and new Su-31, were designed under USSR government sponsorship to be world beaters. The Russian aerobatics team is a government-funded project, and winning has always been a Russian obsession, so they decreed their team would have the best aircraft they could provide them.

SPECIFICATIONS
Wingspan: 26 feet, 11 inches
Length: 23 feet, 8 inches
Horsepower: 360
Rate of climb: 3,150 feet per minute

The airplane is unique in many respects; for instance, like the rest of the breed, it uses a composite wing, but the tube fuselage is all stainless steel and has composite panels bolted onto the outside. The airplane was obviously a government project because everywhere you look, there are pieces that have been milled out of titanium billet. Private industry could never afford to do it that way.

The airplane was the first to offer true supine seating, which many pilots at first found unusual, but not as unusual as the height and size of the stick and the airplane's unusual control responses when judged against U.S. standards. The airplane has huge amounts of raw, blazing performance in every area, but veteran aerobatic pilots all agree that it's an airplane you need lots of practice with to make it realize its full potential.



CAP 232—descended from the French homebuilt Emeraude. One of the first certified was the CAP 10—a two-place aerobatic trainer made famous by the aerobatic formation show team, the French Connection.

been able to take the airplanes' tremendous power, strength and performance and invent maneuvers that would have been either impossible or unrecoverable in earlier airplanes. Just watching something like a knife-edge spin, a shoulder roll, or something like Sean Tucker's "avalanche" is enough to make engineers grind their teeth.

And when they're up there yanking and banking, they aren't just messing around. Hang your head in Patty Wagstaff's Extra or Rick Massigee's Sukhoi after they've returned from a competition flight: if the G-meter shows less than 10 Gs positive and 8 negative, they were just out sightseeing.

In competition aerobatics, pilots are rapidly becoming the weak structural link, and that's why most of the new airplanes use semi-supine seating to give pilots more G tolerance.

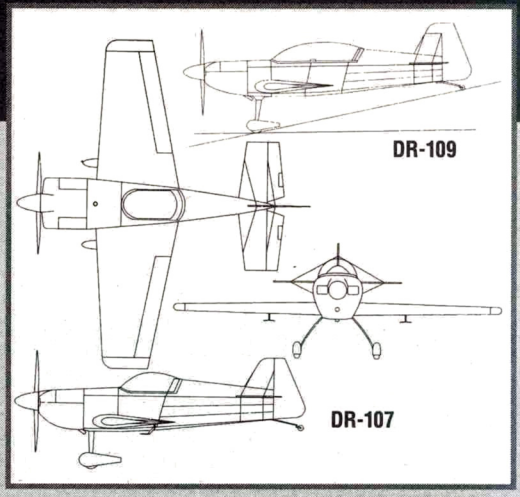
Every one of the airplanes I've talked about is a great R/C subject because the proportions that make a good model also make a good acro mount. The only thing that you'll miss will be bruises caused by the seat belts and bloodshot eyeballs caused by negative G!

THE ENGINES!

As hot-rodders know, "The only substitute for cubic inches is more cubic inches," so big motors have become an all-important ingredient in the unlimited aerobatics game. With the exception of the mini-monsters such as the G-200 and the One Design, most of the new birds start out with a 6-cylinder, 260hp, 540ci Lycoming and hop it up from there; getting 350hp out of a 260hp engine is not unusual.

The Russians have dominated world contest aerobatics for years. This may be partly attributed to politics, which is impossible to keep out of the contests; but much credit has to go to their basic, Vedenyev M-14P, 9-cylinder radial engine. Some consider it to be just a little crude by our standards, but it puts out gobs of power (360hp), has lots of displacement (620ci) and is geared and supercharged to boot. This all allows it to swing a fat prop that looks more like a cut-down helicopter rotor than a propeller. The net result is enough thrust to pull a battleship (if you are into such things). If nothing else can be said about the M-14P engine, it sure sounds neat as it growls around in the aerobatics box.

RIHN DR-107 ONE DESIGN



The One Design was the first of the back-to-basics designs. They were meant for a competitive aerobatics event in which every pilot would fly the same kind of airplane and use the same engine—hence the name, One Design. The tiny, wooden wing is attached to a tubing fuselage that was designed to be wide enough to make any pilot of any size comfortable—and it does. With only 160hp, the airplane can really boogie on takeoff, and only seconds into the flight, you realize you have hold of an airplane that requires a light touch. At the same time, it gives an unbelievable performance for the power.

Its roll rate will match that of any aerobatic airplane out there, and it will draw vertical lines far longer than it should be able to for its relatively low horsepower.

Of course, the entire One Design concept will probably fall apart, but only because of America's tendency toward "hot-rodding" everything that moves. Who would want to build such a neat little airplane with only 160hp when a 180 will fit under the hood just as well?

SPECIFICATIONS
Wingspan: 19 feet, 6 inches
Length: 17 feet
Horsepower: 150 to 180
Rate of climb: 2,900 feet per minute

COST OF ADMISSION

There is one other ingredient that fuels unlimited aerobatic competition—money! The average, factory-built, unlimited aerobatic airplane starts at a cool $150,000, and airplanes such as the Extra 300L top a quarter of a million—fully equipped. You have to want to burst blood vessels really badly to spend that kind of money!

Having mentioned the ugly five-letter word—money—it's important to say we're talking about "unlimited"-category airplanes here. In the entire world, there aren't as many as 150 pilots actively engaged in unlimited competition because it's such a demanding, totally engrossing and expensive sport. Your life revolves around practice, practice and more practice.

But move down one category into advanced, and the number of competitors leaps dramatically—possibly into the thousands. This is partly because of the lower expense involved and partly because "intermediate" and "advanced" categories let those involved have a life outside of practicing. In these categories, the most common airplane is the much less expensive, two-place Pitts S-2B, and last year's advanced category was taken by an elderly, but well-flown, 200hp Pitts S-2A.

Just to show that the caliber of the bullet isn't as important as where you aim it: last year, a U.S. team member was flying a two-aileron, flat-wing Pitts S-1 C that was outmoded by the late 1960s, but he flew it well enough to make team alternate. His simple, relatively inexpensive, little airplane beat a lot of high-dollar, high-tech super-machines to win that spot.

So here's a quick synopsis of the current crop of machines, and they're guaranteed to make you understand what an R/C pattern ship feels like from the inside.

Every one of the airplanes I've talked about is a great R/C subject because the proportions that make a good model also make a good acro mount. The only thing that you'll miss will be bruises caused by the seat belts and bloodshot eyeballs caused by negative G!

The average, factory-built, unlimited aerobatic airplane starts at a cool $150,000, and airplanes such as the Extra 300L top a quarter of a million—fully equipped. You have to want to burst blood vessels really badly to spend that kind of money!

16th Annual Scale Maste

Qualifiers compete for the gold in Columbus, OH

Mike Barbee and Jim Rose prepare Mike's 16 lb. DH 82 Tiger-moth; Duncan Hutson plans; 88 in. wingspan; Supershrink Coverite; Futaba 1024 ZAP radio; Laser* 150 burning Cool Power* 10%; 16th overall.

by JOHN E. JUNDT

EARLY ON a Friday morning, we were greeted by the cacophony of engines as test runs signaled that a flying competition was about to begin. The place: Darby Dan Airport in Columbus, OH. The dates: September 6 through 10. The event: the finals of the 16th Annual U.S. Scale Masters Championships. This international R/C event brought 63 modelers to Columbus, and every one of them had made it here by placing in one of more than 19 heat qualifiers held throughout the world.

Best in Class—Jet. Terry Nitsch's F-86 Minute Man Sabre Jet lands on its final Masters flight. BVM* kit; 68 in. wingspan; 14.5 lb.; powered by BVM .91 using Power Master* fuel; JR* PCM 10S; Coverite* Presto and acrylic enamel finish. Terry took first and is the U.S. Masters Grand Champion for the third time.

Just back from the first Jet World Masters Championship in Europe, where he finished first—as did the U.S. Team—Garland Hamilton flew this BVM F-80C Shooting Star to fifth place. Weighs 18 lb.; 80 in. wingspan; BVM .91 engine; Powermaster fuel; PPG paints; Airtronics* Infinity 10-channel radio.

Rolling thunder! Nick Ziroli Sr.'s scratch-built P-38J Lightning "Stinger." Weighs 40 lb.; 114 in. wingspan; lacquer finish; Airtronics Vanguard 7 radio; two Zenoah* G-45 engines.

Championships

PHOTOS BY JOHN E. JUNDT

John Cole's JN4D Curtiss Jenny; Proctor kit; 10.7 lb.; 88 in. wingspan; Coverite; Saito 80 engine; Byron fuel; JR radio; 32nd overall.*

Activities actually started with a Masters Golf Scramble on Wednesday. On the next day, we moved to the U.S. Air Force Museum in Dayton, OH, for scale static judging in the Museum's Memorial Park. The Museum is the oldest and largest military aviation museum in the world, and it was closed to the public so that it could be used by Masters participants and their guests. Along with being able to browse throughout the Museum at will, we enjoyed dinner under the wings of the aircraft.

Left: Dennis Crooks' Learjet 35A lands with landing lights aglow. Scratch-built; 27 lb.; 80 in. wingspan; finished with Spies Hecker paints; two O.S. .77 engines burn Byron* fuel; Futaba* 8-channel. Dennis finished second overall. Right: Nick Ziroli Jr.'s scratch-built F6F-3 Hellcat; Nick Ziroli Sr. plans; Sachs* 5.2 gas engine; 96 in. wingspan; 49 lb.; Airtronics Vision radio; eighth place.*

THE ACTION STARTS

The start of the competition: chief judge Kent Walters, who, with his Douglas Dauntless, took first place at the first Masters in 1980, had his judges briefed, primed and ready to go. Shortly after 8 a.m., flight-line director Sally Brown had round one started and away. At the Masters, the competition is as keen as it can be. Contestants must not only be outstanding craftsmen but also outstanding pilots.

First up was Kim Foster of Mansfield, OH, flying his 15-pound Sopwith Pup powered by a Laser 200 engine. Soon afterward, all four

Jeff Foley and his beautiful Lockheed T-33A. Jet Model Products kit; JR radio; 20 lb.; 85 in. wingspan; K&B* paints; O.S. Max .91 runs a Dynamax* fan on Omega* 5% fuel. Jeff flew to third place.*

'95 U.S. Scale Masters Championship Awards

Pos.	Pilot	Model	Static	Flying	Total
1	Terry Nitsch	F-86 Sabre Jet	96.500	94.833	191.333
2	Dennis Crooks	Learjet 35A	97.000	91.833	188.833
3	Jeff Foley	Lockheed T33A	96.500	90.916	187.416
4	Eugene Job	Hawker Sea Fury	96.000	90.750	186.750
5	Garland Hamilton	Lockheed F-80C	96.000	90.500	186.500
6	Kim Foster	Sopwith Pup	97.000	89.416	186.416
7	Dave Lovitt	HC 130H Hercules	96.500	88.666	185.166
8	Nick Ziroli Jr.	F6F-3 Hellcat	95.000	90.000	185.000
9	Charles Nelson	VKS-&F Waco Cabin	97.500	87.250	184.750
10	Dave Ribbe	F-16C Falcon	95.500	89.000	184.500

SPECIAL AWARDS

Award	Sponsor	Recipient	Aircraft
High Static Score	Horizon Hobby Dist./JR Remote Control	Charles Nelson	VKS-&F Waco Cabin.
Best Markings & Graphics	Dry Set	Nick Tusa	Fokker D-VII
Pilot Choice: Best Military	Robart Mfg.	Gary Parker	Albatross Dva
—Best Civilian	Pacer Technology & Dineen Excavation	Phil Sibille	Piper Super Cub
Best Craftsmanship	RC Aviation & Country Club	David Hayes	Ayres Thrush
Best in Class: Biplane	Proctor Enterprises	Kim Foster	Sopwith Pup
—Jet	New Jobs Inc.	Terry Nitsch	F-86 Saber Jet
—Monoplane	Robart Mfg.	Eugene Jobs	Hawker Sea Fury

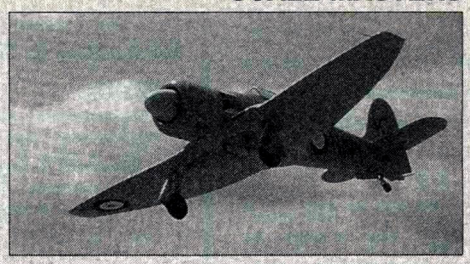
Charles Nelson's VKS-7F Waco Cabin biplane rolls out with landing lights on. Scratch-built; 32 lb.; 93 in. wingspan; Sig* Koverall and dope finish; Seidel* 7-cylinder radial engine; Red Max* fuel; Airtronics Vision radio; first in static with 97,500 points; ninth overall.

flight lines were active.

Jeff Foley, flying his Lockheed T-33A, and Terry Nitsch, flying his North American F86 Sabre Jet, tied for round-one high-flight scores with 92.750 points each. The gauntlet was down with a most challenging benchmark. For all five rounds and through varying climatic conditions, the standard of flying was exceptionally high.

At the start of Saturday's events, it was so hazy and foggy that the arrival of morning seemed little more than a rumor. Conditions quickly improved, though, and round three was soon in flight. Though flying was occasionally halted because of drizzle, an efficient flight line completed rounds three and four well within the allotted time.

During the lunch breaks, excellent flight demonstrations kept the crowd riveted at the flight line. Especially well-received were: Frank Noll, who flew his 1/3-scale IAC One Design; Paul Soha—a current AMA national champion—flying one of his helicopters; and Terry Nitsch, with his turbine-powered Hot Flash jet monoplane. Not to be outdone by the 'copters and airplanes, a rocket team headed by Ross Dutton from Magnum Rockets Inc. received clearance and a time window for rocket launching. With audience countdowns, 1/5-scale rockets blasted to near record heights of 2,000 and 5,000 feet for the enjoyment of all.



Eugene Job's beautiful Hawker Sea Fury on final. Vailly Aviation* plans; 40 lb.; 90 in. wingspan; Desert Aircraft* gas engine; JR Unlimited 8 radio; finished with the same paints as the full-scale. Gene finished fourth overall and won the Best in Class—Monoplane.

Best of Class

In recent years, quiet but persistent voices have argued that today's R/C scale jets should not be allowed to compete against prop-driven aircraft at any of the scale events. Others argue that WW I aircraft should have their own class owing to their lighter wing loadings and tail skids.

Fortunately, the U.S. Scale Masters has held fast to its convictions and lets any and all scale airplanes compete against one another; thus, with meaning and integrity, it's able to declare a *true* Masters champion.

In an effort to allow like aircraft to compete directly against one another, however, three new events were initiated at the 1995 U.S. Scale Masters. As well as the overall Grand Champion, this year's competition also recognized a Best of Class category among biplanes, jets and monoplanes. The winners were decided by adding the static score to the average of *all* five flight rounds. The philosophy was to give a "total task" award that recognized consistent performance throughout the event. Not only were these new classes greeted with great enthusiasm, but so were the trophies; the selection committee mounted carved, wooden, scale models from the U.S. Air Force Museum on each trophy base.

Many pilots commented that they hope the '96 Masters will be "déjà vu all over again" and that the Best of Class awards will be continued.

• **Saturday night.** At the Saturday night banquet, 197 people had a jolly good time. It was obvious that the evening would be one of harmony, as a barbershop quartet crooned to help settle dinner. Next, those who had participated in the Golf Scramble were allowed to play through and then recognized and awarded appropriately; after that, the special awards were given out.

A very distinguished guest graced the banquet—none other than USAF retired General Paul Tibbets. General Tibbets, then a colonel, was the pilot in command of the Enola Gay during the Hiroshima mission at the end of World War II. Everyone who had the privilege of meeting this fine gentleman truly enjoyed the experience.

• **Sunday finals.** Sunday morning broke so bright and clear that we all blinked in the sun-

Sponsors

Primary sponsors—Pacer Technology; Dinneen Excavating.
Associates—Dry-Set Model Markings; Robart Mfg.
Patrons—Radio Systems; Futaba Corp. of America; Horizon Hobby Distributors; JR; New Jobs Inc.; RC Aviation Country Club; *RCM* magazine; *Scale R/C Modeler* magazine.
Advocates—Artais Weather Check Inc.; Audio Encounters; Columbus Orthopedic Prosthetic & Orthotic Center; Corks R/C Club; Distinctive Brass; Foley Mfg.; Glenn Torrance Models; Hansen Scale Videos; Jennings Products; Joe David; Neuman Optics; Paul Reiner; Propwash Video; Sheldon's Hobbies; The Columbus Dist. Co.; Budweiser; The Golf Car & Equipment Co.; Vailly Aviation.

Gary Parker's fine Albatros DVA about to touch down. Proctor* kit; 22.5 lb.; Enya* VT 2.40; Byron 10% fuel; Coverite, auto lacquer and urethane clear; modeled after the "STROPP" in the Smithsonian Institution; complete cockpit; onboard glow; Airtronics 8-channel radio; Pilots' Choice—Best Military.

shine like Punxsutawney Phil. Spectators came out in force to watch, and most stayed through the awards ceremony. As he landed his Dornier DO230 for the last flight of the final round, Al Kretz brought the championship to a close.

Sam Wright served as announcer and MC for the awards ceremony, and he handled the proceedings in his usual relaxed and inimitable way. He took the time to give winner Terry Nitsch special recognition. As well as winning the 1995 Masters with one of the highest flight scores ever, Terry also worked as event chairman for over a year to bring this 1995 event to fruition. In 1992, Terry won the Masters and the 1992 AMA Nationals and he was second at Top Gun. In 1993, he placed second at the Masters, first at the AMA Nationals and second at Top Gun. In 1994, he was first at the Masters and first at Top Gun. In 1995, he defended his titles by placing first at Top Gun and first at the Masters.

There's both good news and bad news for competitors. The good news is that Terry and his F-86 Minute Man competed together for the last time at this Masters championship; the bird that performed so well for him is to be retired. The bad news for competitors is that Terry will be back in 1996 with a new plane, and it's rumored to be a jet with turbine power. Stay tuned....

Masters Trivia

Organization
- Masters chairman—Harris Lee
- Event chairman—Terry Nitsch
- Contest director—David Brown
- Flight-line director—Sally Brown
- Chief judge—Kent Walters
- Voice of the masters—Sam Wright

Monos vs. bipes
- Monoplanes—67.9%
- Biplanes—32.1%
- Of the monoplanes—14.3% were jets.

No. of entrants—63

Radios used
- Futuba—37.7%
- Airtronics—31.1%
- JR—29.5%
- All other—1.7%

Fuel used
- Gas—35.8%
- Morgan—30.2%
- Byron—17%
- Powermaster—11.3%
- All other—5.7 %

Engines used
- O.S.—35.2%
- Zenoah—1 6.7%
- BVM— 9.3%
- Enya—9.3%
- Saito—5.6%
- SuperTigre—5.6%
- Seidel—3.7%
- Laser—3.7%
- Quadra—3.7%
- Sachs—3.7%
- All other—3.5%

Tom Polapink's Pfalz D-IIIa flies overhead; scratch-built; Tom's plans; 14 lb.; 74 in. wingspan; Super Coverite and Sig dope; O.S. 120 FS; Cool Power 15%; Airtronics radio; 24th overall.

THE BEST MASTERS EVER?

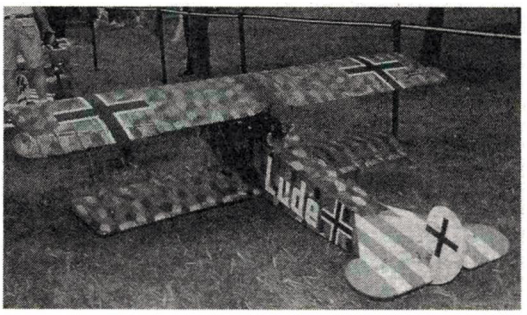
Was this the best Masters ever? Many thought so. With a 75x7,000-foot runway at an elevation of 929 feet and with unlimited pastoral over-fly, most of the pilots interviewed felt that if this wasn't the best site ever, it was at least one of the two best. From the air-conditioned hospitality room (where there were gourmet foods for sponsors and judges) to the Golf Scramble and the U.S. Air Force Museum, Harris Lee stated, "This is the way I dreamed the Masters should be." All agreed about how well the Masters was run.

Two local R/C clubs—The Ohio Radio Kontrol Society (TORKS) and the Westerville Aeronautics Association—united to combine members, efforts and talents to plan, assemble and operate the 1995 Masters. Herschel Worthy, director of sales for Pacer Technology*, says that no R/C event he has ever attended was run better; to show his appreciation and recognition, he sent both clubs major quantities of Zap adhesives to be distributed to the club members who had worked so diligently at this Masters—a job well done!

One suggestion I overheard for possible future improvement: a grass strip for tailskid airplanes. No problem! Terry Nitsch discussed this with one of the event's primary sponsors, Dinneen Excavating, and he was told they only need to know where and when, and it will happen. Dinneen says they'll be able to create a level grass strip that will have the "skidders" feeling as if they're operating off a pool table. Time will tell....

Where will the Masters be held in 1996? Five potential sites are bidding for the honor. Mr. H. Lee could not be pinned down on exactly which one will be picked, but he said that if pressed for a decision, at this time, it looks as if it would be in Florida or Texas. He's sure, however, that he wants the finals to be back in Columbus in 1997—so that the Masters will once again gather at Darby Dan.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*



Nick Tusa's scratch-built, Fokker DVII; 10 ft. wingspan; 48 lb.; Quadra* 100 gas engine; Futaba radio. The meticulous, hand-painted lozenge paint scheme over Koverall earned the Judges' Choice award—Best Markings and Graphics.

Fantasy Flights

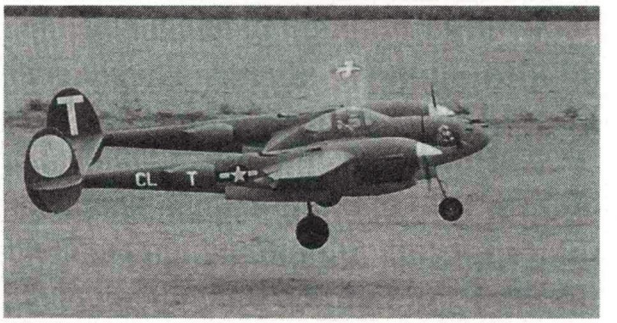
When was the last time you sat in the cockpit of a Lockheed F-117A Stealth, waiting for the hatch to close so that the mission could start? What's that? Wrong orders? OK; then let's head off to the Lockheed SR-71—aka the Lead Sled; the one that flew the first official mission ever for this family of designs. We'll flip to see whether you fly as front-seat pilot or do the back-seat thing. Oh, you wish to take a few more friends along with you? Well then, you may choose from among a B-17G Flying Fortress, a B-24 Liberator and a B-36H. At least those would have been your choices if you had attended the 16th Annual U.S. Scale Masters Championships.

For attendees of this event, Teresa Jones, of the U.S Air Force Museum, opened the museum for a private showing and also arranged for the aforementioned birds to be open so that the judges, sponsors, fliers and guests could crawl, browse, sit in, and fantasize to their hearts' content. Hangar flying can help you to work up an appetite, so a lovely, sit-down dinner under the wings of the aircraft was enjoyed by all. What a day! And what a way to cap off the scale static judging, which took place in the Museum's Memorial Park.

Scale TECHNIQUES

by GEORGE LEU

SCALE MASTERS QUALIFIERS AND NEW PRODUCTS



Nick Ziroli Sr. really put his P-38 Lightning through its paces at the Long Island qualifier. It's powered by two Zenoah* G-45 gas engines.

I'M OFTEN asked how to get started in R/C scale modeling and what's the best way to get involved in scale competition. Well, the answer to both questions is to attend and/or participate in the Scale Masters program.

Ron Weiss flew his giant-scale Fleet Bipe at the Long Island Skyhawks' Scale Masters Qualifier.

The Scale Masters program was started about 20 years ago, and it's set up to have a dozen or so qualifying events at various locations around the U.S. and Canada. The five best competitors at each event compete in the national championship. The Masters Championships are held at a different location every year, so they draw competitors from among many talented modelers all over the country. This year, the Scale Masters was held in Columbus, OH, and Terry Nitsch won for the second consecutive year. Congratulations, Terry!

HOMETOWN HAPPENINGS

Every year, I try to attend at least one local qualifier as either a contestant or a spectator. I like to compete against many of the Top Gun pilots so I can improve my model flying skills. I also like to photograph, inspect and investigate good flying designs that I might want to consider for a future project.

Meeting good friends and doing some hangar flying is also a great reason to attend any local event. At the Long Island Skyhawks' Masters Qualifier, I had a chance to speak with many great modelers, including Nick Ziroli Sr. (who was competing with his impressive P-38 Lightning), Ron Weiss (who flew his giant-scale Fleet Bipe) and Mark Frankel (who competed in Team Scale with Bob Boswell flying Mark's F4D Skyray). I also met Gerry Yarrish—the new editor of *Model Airplane News*. We both checked out the action and took photographs for the "Scale Techniques" column. It was there that I got the idea to induct Gerry into the famous F-Troop. (We'll cover this wonderful scale modeling group in a future column; you've been warned!)

The Long Island qualifier was very well organized. CD Roy Vaillancourt informed me that he and the Long Island Skyhawks club had held a "dress rehearsal" flying meet earlier in the summer to determine whether any weaknesses existed in their planning. It was a good idea, because this event went off without a hitch. I hope to return for the next qualifier to compete.

PANEL LINES

This month, I describe another way to make scale panel lines on fiberglass-finished models. This method uses one or two layers of masking tape to form the outlines of the panel lines and is used to reproduce non-adjacent panels one at a time.

To roll the edges down, use a wallpaper seam roller. This flattens the edge of the masking tape and prevents liquids from seeping out. Then make up a solution of primer that has a consistency somewhere between maple syrup and water. I use Du Pont 31S lacquer primer, but I'm sure there are other primers on the market that work just as well. I like the lacquer-base products because they dry quickly, and I can put two or three coats on in a short time.

When the primer mix is ready, paint it in the masked-off area with a 1-inch-wide camel-hair brush. It may seem a little thick, but that is what you want. When the first coat has dried, add another four or five coats, and allow ample drying time between them. Be sure to cover the area thoroughly, and do not worry

Gerry Garing holds his Travelaire up for a static score at the Long Island qualifier. Gerry placed third in the Expert class. The static judges were (left to right) Mike Gross, Fred Thumb and Tom Polapink.

about splashing over the tape (you're supposed to do just that). Use a sanding block with 320-grit wet sandpaper to sand the area (including the tape) until the surface is smooth and the edges of the tape just begin to fray. Then lift the tape from the surface, and your panel is ready for finishing.

Many areas on an aircraft need a panel line, but the panel does not have four straight sides. The above-mentioned technique works well on the irregularly shaped inspection panels that are found on fabric-covered aircraft such as the Pitts Special and the Piper Cub. It also works well on jets, such as the F-15, which have a long, single-edge panel line along the wing's leading edge.

WING PANELS

When you do this type of panel work on a wing, start at the wing's leading edge, and apply the primer from the masking tape down about 1½ to 2 inches. Wet-sand toward the tape line, and the primer will "feather in." Continue this method as you apply the panel lines toward the wing's trailing edge. Do a final, 400-grit wet-sanding of the entire surface when you have finished the panel lines. This takes the sharp edge off them and gives an authentic look. Be careful; don't remove your lines with aggressive sanding.

You can vary the depth of your panel lines by adding extra layers of masking tape; for well-defined panel lines that are about 1/32 inch thick, use 1/32-inch-thick tape.

For panels that are about ½x1 inch, such as inspection hatches, I sometimes apply three layers of masking tape. Instead of my primer mix, I apply Sig* Epox-o-Lite to the masked-off area. When it has dried, Epox-o-Lite can be wet-sanded as easily as lacquer primer, and it makes the panels more noticeable because it makes them thicker.

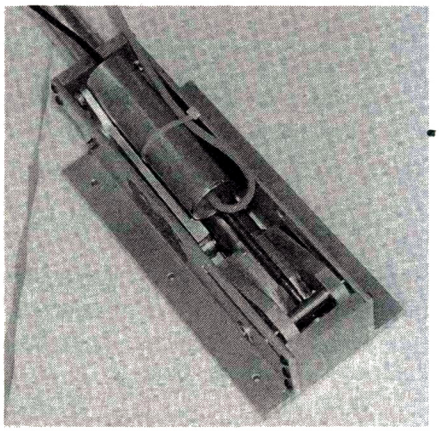
Inspection panels, panel lines and other surface details really make a model come to life. Try these and my earlier methods on your next couple of projects, and you'll become the local "gee-whiz" guy. And remember, have fun.

VAILLY AVIATION

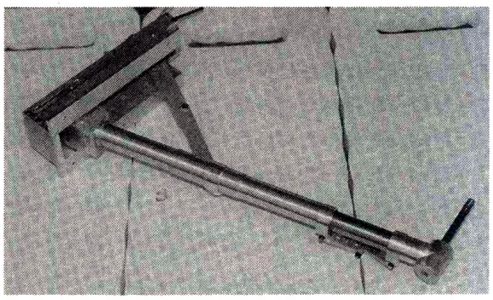
At the Long Island qualifier, I had a chance to see some new products, including Vailly Aviation's new prototype landing gear for their 76-inch-long, 90.5-inch-span Focke-Wulf Fw-190A. Roy Vaillancourt's Vailly Aviation* specializes in giant-scale aircraft and related accessories. I asked Roy about his company and his involvement with giant-scale aircraft since the late '70s.

"I've always enjoyed the larger planes because they behave so realistically in the air. People initially inquired about my designs, and that ultimately led to my making plans available through Vailly Aviation. One thing led to another, and pretty soon, people were asking for struts, tires, retracts and other accessories. So I decided to make them available on a limited basis."

Roy designed the 100-percent-scale



This prototype, retractable landing gear was designed by Roy for his Fw-190, and it will drop right into the wing. It is pneumatically operated and absolutely scale in operation.



Focke-Wulf retracts to meet his own high standards and, naturally, they fit perfectly into the Fw-190's wing. Roy is also working on a plug for a fiberglass fuselage for the Fw-190.

Roy's designs have done well at the Scale Masters Program and Top Gun, and he constantly improves his plans and designs to keep them current with the latest developments in scale R/C. Roy is available for phone calls, and this is a wonderful service for those who have questions on construction or flying. Give him a call, and pick up one of his catalogues; you won't regret it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

MODEL AIRPLANE NEWS

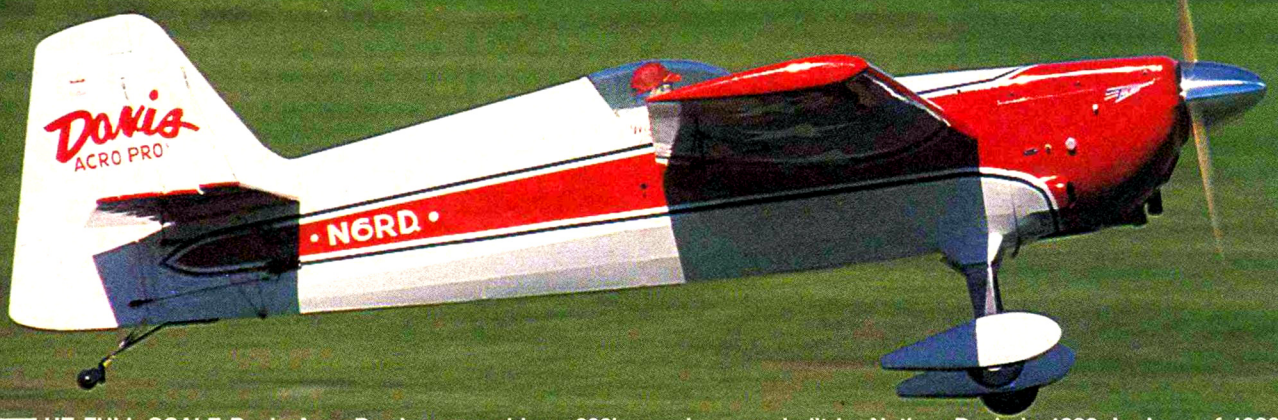
FIELD & BENCH REVIEW

DAVIS ACRO PRO I

PRECISION AVIATION DESIGN

1/3-scale aerobat

by JIM ONORATO



THE FULL-SCALE Davis Acro Pro I, powered by a 300hp engine, was built by Nathan Davis in 1982. In June of 1986, Nathan sold it to Wayne Parrish, who flew the plane in both aerobatic competition and air shows. Unfortunately, the Acro was destroyed in a fire. Luckily for modelers everywhere, Bob Godfrey, owner of Precision Aviation Design Inc.* and designer of three Tournament of Champions winners, decided to produce a 1/3-scale Davis Acro Pro I kit.

THE KIT

I received a kit with jig-built wings, but Precision Aviation also sells the Acro with foam-core wings and "in the bones," ready to cover. The plans and parts are also available separately. The kit comes with an excellent videotape in which Bob Godfrey guides you through construction and shares some of his techniques. It also includes footage of Wayne Parrish flying the full-scale Davis Acro Pro I and Don Lowe putting the model through its paces. Decals are not provided, but they're available separately from Precision. The only thing I didn't like about the kit was that two 1/4-inch-thick aircraft plywood fuselage formers, some of the lite-ply parts and all of the 3/8-inch sheet balsa stab and rudder parts were drawn on the wood and had to be cut out with a band saw. (Bob Godfrey says that future kits will have laser-cut tail parts and router-cut formers.)

SPECIFICATIONS

Name: 1/3-scale Davis Acro Pro I
Type: competition, sport aerobatic aircraft

Manufacturer: Precision Aviation Design Inc.
List price: $675 (w/jig-built wings); $575 (w/foam wings)
Wingspan: 98.25 in.
Wing area: 1,710 sq. in.
Weight: 23 lb., 8 oz.
Wing loading: 31.7 oz./sq. ft.

Airfoil type: symmetrical
Length: 79 in.
Radio: Futaba 7-channel PCM (w/seven servos)
Engine range: 2ci to 4.2ci

Features: the Acro has jig-built, plug-in wings with an aluminum spar and fully symmetrical airfoil. It has a two-piece, detailed, epoxy/glass cowl, epoxy/glass wheel pants, a vacuum-formed hatch/canopy, hefty aluminum landing gear and two sheets of rolled plans. It also contains a complete hardware package, including a Zippy tail wire package, a Zippy control-horn/pushrod package, tail-wheel assembly, hinges, nuts, bolts, blind nuts, locknuts, axles, wheel collars and wheels. A VHS video instruction tape is included.

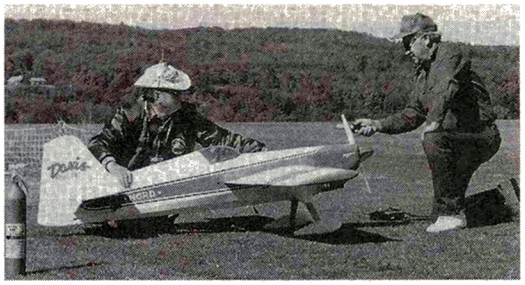
Hits
- Excellent flight performance and low-speed stability.
- Easy-to-follow plans and videotaped instructions.
- High-quality hardware and epoxy/glass parts.
- Good overall appearance.

Misses
- Some parts aren't cut out; they're only drawn (but that will be corrected in future kits).

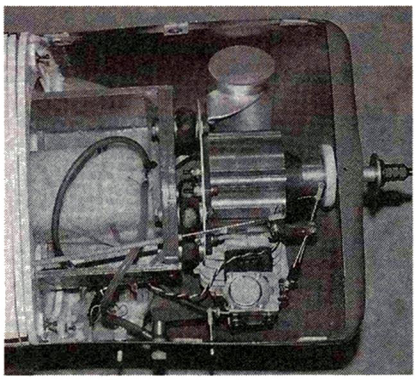
CONSTRUCTION

For most of the construction, I used Zippy White Sandable glue (from Precision) and Great Planes* 30-minute Pro Epoxy to attach the cowl, the firewall and other highly stressed parts of the fuse.

• **Fuselage.** The fuselage is built up with aircraft ply, lite-ply and spruce stringers and longerons. It is well-engineered and has a very strong front end. I particularly like the way the landing gear is attached to the fuse with 1/8-inch-thick aluminum angles for mounting—very sturdy! One of the formers fits inside the cowl, which is attached to the fuse from the front with four 4-40 socket-head bolts and blind nuts. I attached a ball driver to a long piece of brass tube so I could reach into the front of the cowl to tighten the bolts.



to the fuse. The top of the fuse from the front of the turtle deck to the rear of the cowl consists of a one-piece, vacuum-formed, clear-plastic canopy/hatch, which fits over a wooden frame. This assembly is attached to the fuse with six 4-40 socket-head bolts and blind nuts, and it provides unlimited access to the inside of the fuse. Although it isn't shown in the video, the plans show two 3/16-inch-diameter pieces of dowel installed in former F4 to help secure the front of the hatch. These dowels reduce wear in the plastic; the wear, caused by engine vibration, would usually occur around the 4-40 hatch-mounting bolts. The dowels also help to secure the cowl.



A removable cowl top is very handy and makes field adjustments stress-free.

• **Fuselage.** In the canopy, I installed a removable floor on which I installed an instrument panel and a 1/3-scale DGA Designs* pilot bust. For the powerplant, I chose a Brison Aircraft* 4.2ci gasoline engine and a Bisson* muffler (no. 08420). After carefully measuring the length of the engine and the cowl, I cut the fuse sides and installed the firewall with 2 degrees of right thrust. I used Pro Epoxy to glue the firewall to the fuse sides and bottom, and I pinned it with three pieces of 3/16-inch-diameter dowel on each side and the bottom. I installed the engine on vibration blockers (from Precision) and oriented it with the cylinder at approximately "8 o'clock."

The bottom of the fuse that's aft of the cockpit is made up of lite-ply formers and four 1/4-inch-square spruce stringers. The turtle deck is made of foam, and it's covered with sheet balsa before it's attached

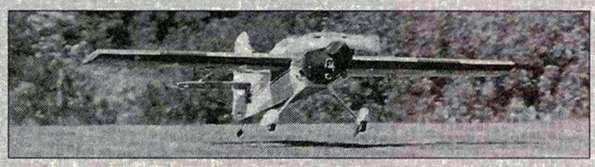
Precision Aviation Design offers the Acro Pro kit with either foam-core or jig-built wings. A ready-to-cover version is also offered.

FLIGHT PERFORMANCE

• Takeoff and landing

The initial flights were conducted on a calm day. My transmitter was set up for the recommended throw on the control surfaces at high rate and 70 percent at low rate. The Acro handled very well on the ground with no tendency to nose-over. I taxied it to the far end of the runway and slowly advanced the throttle. The tail came up quickly, and the plane tracked straight ahead without any right rudder. At about half throttle, the Acro lifted smoothly into the air with its wings perfectly level. The whole takeoff run consumed less than 75 feet of runway.

Landings were a pleasure. The Acro has a shallow glide slope that allows it to descend very slowly, and it also slows down quickly when the throttle is cut to idle. On the first landing, I maintained power until the plane was about a foot off the runway, chopped the throttle and waited for the Acro to slow down, then I applied just enough up-elevator to give the plane a gentle flare. The result was a very smooth, three-point landing. I had to make a dead-stick landing on the second flight, and the Acro handled flawlessly.



• Low-speed performance

The Acro is smooth and predictable, and it has a low stall speed. Stalls are gentle and straight ahead. The plane doesn't lose stability, and it can execute all but vertical maneuvers at partial throttle.

• High-speed performance

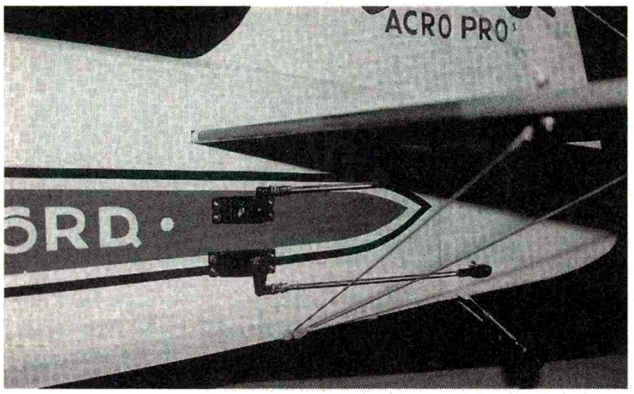
The Acro tracks extremely well and is a smooth, stable flier, but even with the Brison 4.2, it wasn't very fast. Using the recommended throw on all control surfaces, I didn't encounter any bad tendencies at full throttle.

• Aerobatics

The plane's relatively slow speed gives a very graceful appearance to all maneuvers. The first axial roll I did was a slow roll, and I was surprised at how well it was executed. The slow speed gave me plenty of time to make the proper rudder inputs as the Acro passed through knife-edge attitude. I was able to get a fairly respectable roll rate by increasing the aileron throw beyond 15 degrees at high rate. Four-point rolls were smooth and precise.

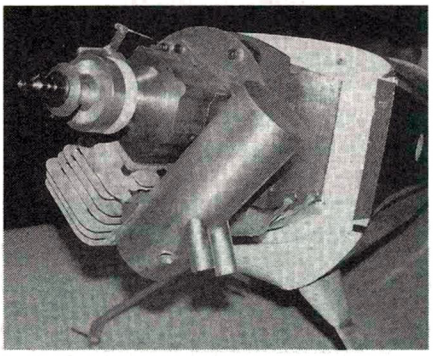
Inside and outside snap rolls were quite fast, and I did them with the plane heading up, down and level; it didn't seem to make any difference. Sustained knife-edge and outside, 360-degree turns were no problem; I was amazed at how tight the outside 360 was! Spins were very gentle (almost as if they were in slow motion) with immediate recovery when the controls were released. Full-throttle, full-elevator deflection loops (both inside and outside) were made without any loss of heading. No elevator input was required, and when I rolled the Acro to inverted flight, it flew hands-off and as straight as an arrow.

By the third or fourth flight, I was having a ball with this plane. I did Lomcevaks, side slips, vertical hovers and, finally, a so-so torque roll, which will take a lot more practice.



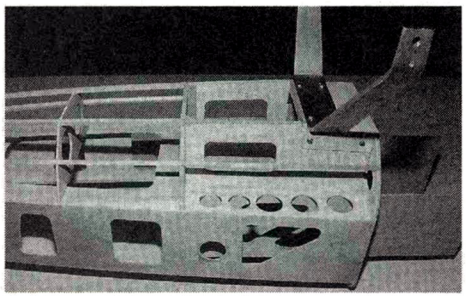
Whenever possible, this is the way it should be done on a giant-scale ship; having shorter control rods means less chance of flutter.

some balsa parts, which had to be cut out of 3/8-inch sheet balsa. Pieces of 3/8-inch-square spruce are used to provide hard points in the fin and stab where the tail wires will later be attached. The elevator halves are not joined because each is controlled by its own servo. Pin hinges are also used for the rudder and elevator hinges. The tail feathers can either be permanently attached to the fuse, or they can be made removable as shown on the plans. I made mine removable. After I had covered the tail feathers, I attached the tail flying wires provided in the kit.



A Brison Aircraft 4.2ci gasoline/ignition engine and high-quality Bisson muffler make up a quiet, powerful, easily cowled power system.

• **Wings.** The two prebuilt wing panels are outstanding. They're jig-built with 1/2-inch-thick foam ribs and spruce spars, and they come about 90-percent complete. They're strong, light and as straight as an arrow. The phenolic tubes have already been installed, and they fit snugly on the aluminum spar. There isn't much to do on the wings except cut out and install the ailerons, glue on and shape the tips and root caps and install the servos. The aileron outline drawn on the wing was farther inboard than shown on the plans. The plans show the configuration with the foam-core wing, which is slightly different from the jig-built wing; but these minor differences do not adversely affect the flight characteristics of the plane. The ailerons are attached to the wings with the pin hinges that are provided in the kit. The wings are completed with the installation of two 1/4-inch anti-rotation dowels in each panel.



The aluminum landing gear is hefty, and it's included! Epoxy/glass wheel pants are also included.

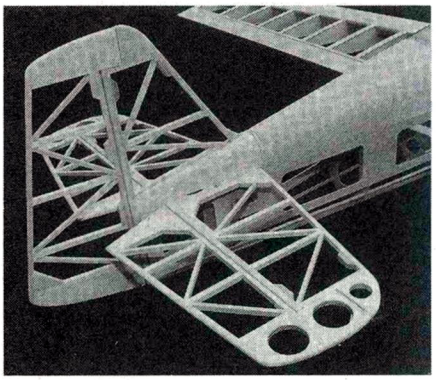
• **Tail feathers.** The tail feathers are built up with 3/8-inch-thick balsa stripwood and

SETUP AND FINISHING

The wing panels slide onto an aluminum tube spar and are prevented from rotating by dowels that fit into holes in the fuse sides. The panels are held on the aluminum spar with 4-40 socket-head retaining bolts that go through the top of the wing and thread into the spar. I used a Robart* wing incidence indicator to set the wing incidence to 0 degrees.

I covered the Acro with Missile Red, white and Insignia Blue Top Flite* MonoKote, and I used HobbyPoxy* paint for the cowl, wheel pants and hatch. I used Precision Aviation's graphics. The final touch was the addition of a beautiful 5-inch-diameter P-51-style Tru-Turn* aluminum spinner.

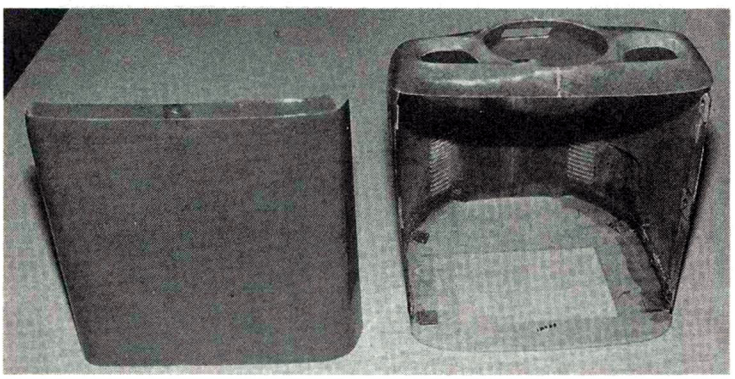
I used a Futaba* 7-channel PCM radio and seven servos. With the exception of the two elevator servos, which were S130s, the servos were of standard size. One of the elevator servos had to be rewired to reverse its direction. The two elevator servos and the two rudder servos were installed in the rear of the fuse, and I used one servo for each aileron. The receiver battery was a 4-cell, 1300mAh pack, and the elevator throw was set at 10 degrees, the ailerons at 15 degrees and the rudder at maximum possible deflection.



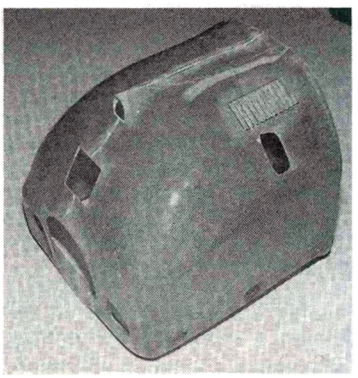
The built-up tail group can be permanently fixed to the fuselage, or it can be made to be removable.

The Davis Acro Pro I is a well-engineered plane that looks great, is very aerobatic and has good low-speed stability. I highly recommend it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*



The high-quality epoxy/glass cowl has a removable top to allow easy access to the engine compartment.



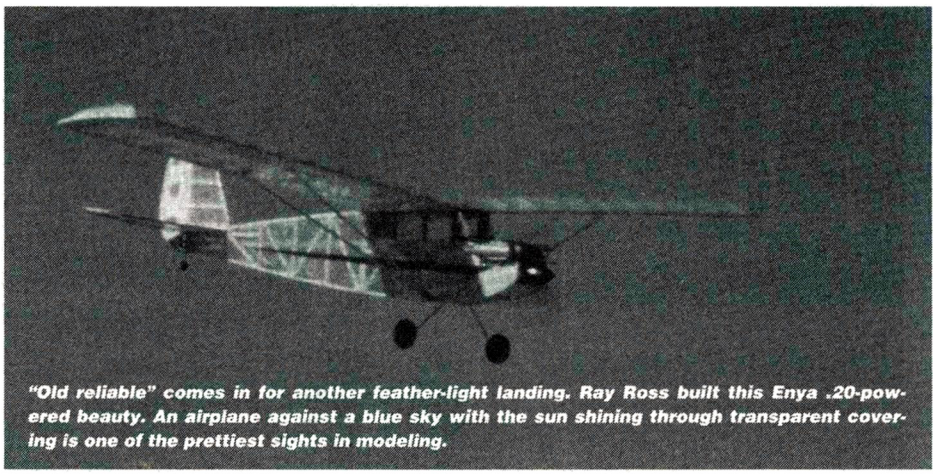
AMA scale contest board member Ernie Harwood flips the prop on his Mills .075-powered scale version of Walt Good's Rudder Bug. The lake in the background is next to the runway and was available for floatplanes.

A BIG EVENT FOR SMALL WINGS

8TH ANNUAL Small Steps Fly-In

by RANDY RANDOLPH

PEOPLE BUILD and fly model airplanes for a variety of reasons: some need the rush of competition and the strained song of engines to forget the cares of the day, while others need the quiet of their shops and the sensuous feel of a knife slicing balsa to find the same escape. Those of us who find pleasure in building and flying small airplanes tend to fall into the latter category. Still, there is within us a desire to impress our friends with the great things that can be done with very little. In that respect, there is competition.



"Old reliable" comes in for another feather-light landing. Ray Ross built this Enya .20-powered beauty. An airplane against a blue sky with the sun shining through transparent covering is one of the prettiest sights in modeling.

PHOTOGRAPHED AWAY AT SOLITUDE

THINKING SMALL

Sponsored by *Model Airplane News*, the annual October Small Steps Fly-In in Dallas, TX, is a great stage for the Small Model Airplane Lovers League (SMALL) members to show their new creations! Nearly 50 from as far away as Sun City, AZ, brought over 150 airplanes of all types and descriptions. They had one thing in common: all airplanes were powered by engines with displacements smaller than .26ci. That was, in fact, the only rule, but it included electric as well as CO_2! Some free-flight (both rubber and gas) and U-control models also met the criteria.

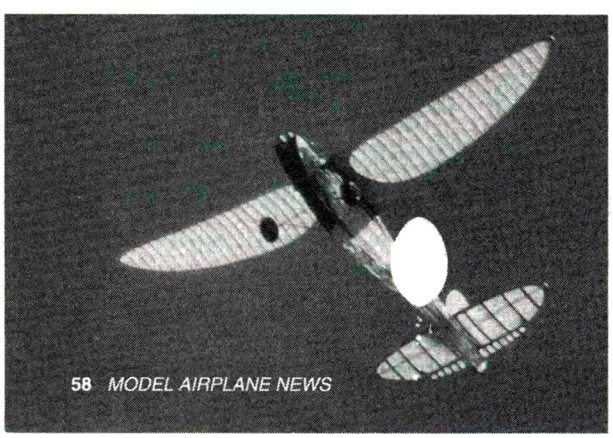
Weather-wise, Dallas in October presents the best of flying. Saturday had nothing that could be called wind, even though there was a variable drift as the high temperature reached into the low 70s. Needless to say, the air was filled with airplanes! Sunday did bring a breeze from the south with a temperature that was a degree or two higher, but on both evenings, the field was busy well into twilight.

About 20 Weblo scouts were there as guests of the Dallas R/C Club's Dan Tips, who had held a Delta Dart program the week before. They held several "All up, last down" contests of their own, and later, they all enjoyed some R/C stick time with Dan and other members of the club. Although not entered in the Fly-In, they all qualified as "Small Steppers," and most were pretty well sold on model airplanes in general and small R/C airplanes in particular.

IMPRESSIVE LITTLE AIRPLANES

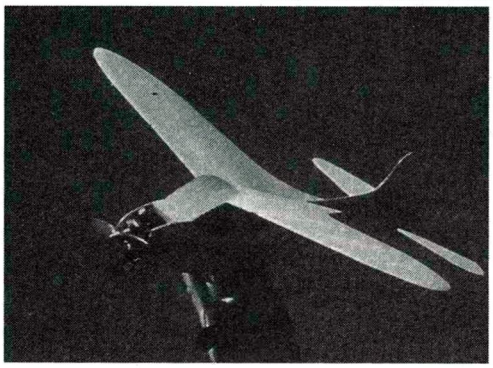
Airplanes were of many shapes and sizes with little duplication. Andy Clancy's* built-up Lazy Bees were, however, well-represented, as was the dandy Cox* ARF version. In my opinion, the Cox Lazy Bee is the best ARF ever produced—and the easiest to fly!

Another impressive airplane in a field of impressive airplanes was Ross Woods' scaled-up Answer. Designed by Scotty Murray—a member of the New York



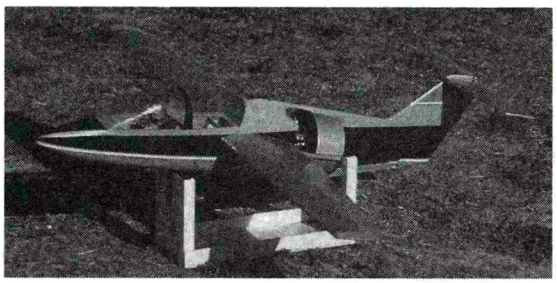
The sun does a good job of showing off the beautiful Ritz wing on Ross Woods' 30-percent-oversize Answer. The wing, with elliptical dihedral, was built in a jig.

This multicolored Miss Diamond ("Model Airplane News" plan no. FSP09891), which is powered by a Fox .15, was built and flown by Danny Wampler. As indicated by his use of a vertical antenna, Danny seems to have fallen under the spell of Joe Wagner.



Many BeeTweens have been built, but Tommy Day went one step further with his Bi-Tween—still the same .049 power, but with a slightly smaller bottom wing.

Left: the all-balsa Cox .01-powered airplane built from plans spirited from the home of H. A. Thomas. It first appeared as a construction article in "Air Trails" magazine in the early '40s. The original was lost and never rebuilt. This modern version, built by Steve Staples and named "HATrick" after its designer, is an excellent example of what the Small Steps Fly-In is all about. Right: this Viking was originally intended for electric power. Stan Brock decided to build it for an O.S. 20, and the conversion proved an excellent flier. Stan usually flies indoor rubber at the Bedford Boys' Ranch in Bedford, TX.



Left: Paul Wellenborg at last got around to building another fantrainer. Paul is a regular at all small-airplane fly-ins and his fantrainer is one of the more popular plans offered by "Model Airplane News" (FSP01901). Right: Joe Lindquist prepares his GLH II and, because it was powered by a piped O.S. .15, it did just that! Joe is from Richardson, TX, and he likes fast airplanes.

he was unable to return on Sunday, so we lost the chance for in-flight pictures of these sweet airplanes. Next year will be different.

Not only did CD Eddie Williams ensure that the event ran smoothly, but he also found time to test-fly airplanes for Send Aero Aviation's Emmett Fry, who always brings a new airplane just for that purpose. This year it, was an Aeronca Champ. (With Steve Staples, Emmett is a guiding light behind the Little Rock SMALL fly-in every June.)

Looking, asking and then listening to the conversation of creative people is a most rewarding learning experience. Everyone who attended went home with new ideas and better ways to do old things. Some even went away with prizes donated by Cox Hobbies and *Model Airplane News*. Always a highlight is the voting for the Best All Around Good Guy. The prize was a beautiful briar pipe provided by Paul Guilland of Saint Claude, France, and this year's winner was Buddy Irwin.

If you would like to join SMALL*, it is easy to do. Place your hand over your heart and say, "I promise to build and enjoy small model airplanes," and you instantly become a life member. The organization has only two rules:

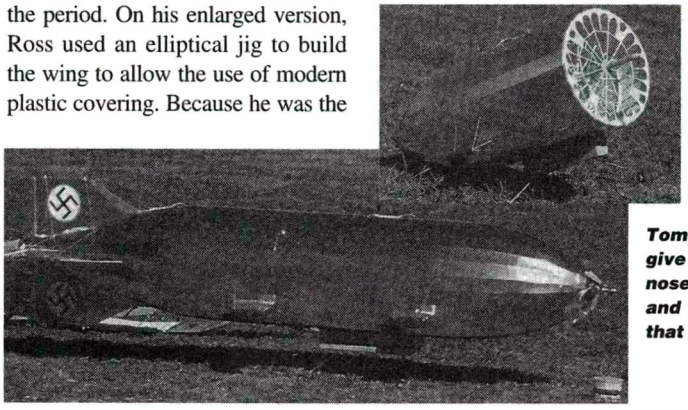
- This organization shall have no rules.
- These rules can not be amended.

There are thousands of members worldwide; join today!

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

Skyscrapers club back in 1939—the Answer appeared in the August 1940 issue of *Model Airplane News*. It had a very thin, almost single-surface wing that was warped into elliptical dihedral by shrinking the silk covering. It became known as the "Ritz wing" and was used on several designs of the period. On his enlarged version, Ross used an elliptical jig to build the wing to allow the use of modern plastic covering. Because he was the only one on his frequency, his .26 Surpass-powered Answer spent most of both days silently cruising over the field with the engine at dead slow—a very lovely sight!

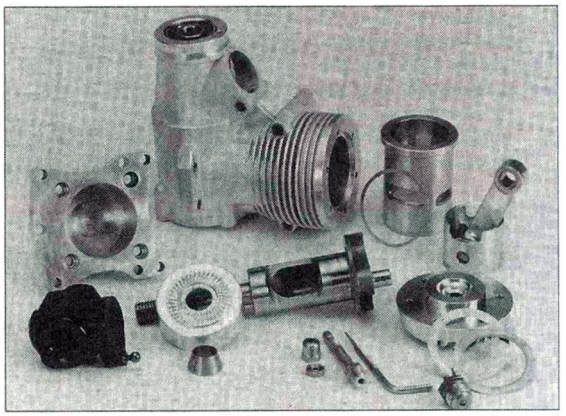
Two Curtiss Jennys—one sporting a Cox Dragonfly and the other chugging around with an O.S.* .26 Surpass—were constant attention-getters. Eugene Bryant flew on Saturday, but it was overcast and



Although it never quite got airborne, Tommy Day's model of the Hindenberg did give it a good try. That's an O.S. .15 in its nose. Inside, its structure is a mass of balsa, and the covering is Lite-span. Tommy says that it will fly—one of these days!

by DAVE GIERKE

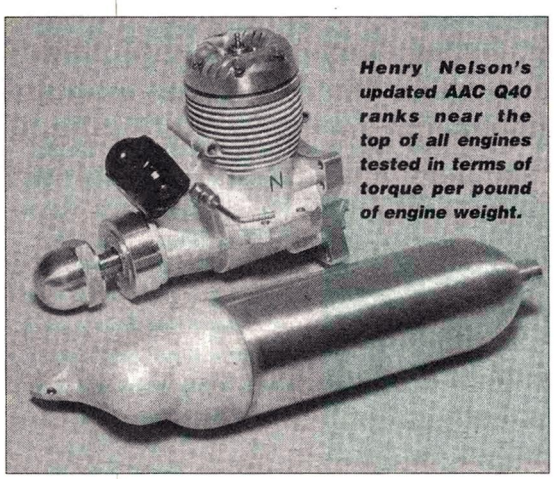
NELSON AAC Q40



After cleaning, all components look like new.

IN 1992, the "Real Performance Measurement" (RPM) column got started by testing the Nelson* ABC Q40 racing engine. The grapevine said it was fast, but our aerial experiment group wasn't prepared for 160mph blasts from our overweight, telemetry-equipped test model. This engine was something special!

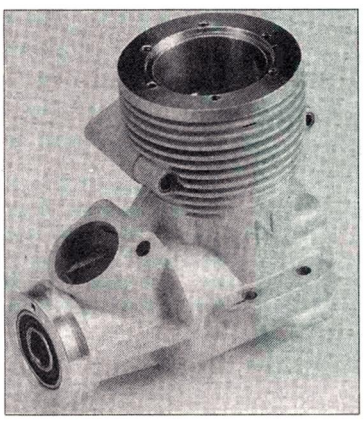
Dynamometer tests revealed that the Q40 produced 2.72b.hp at 19,000rpm; and the power curve remained flat, dropping less than 5 percent over the next 3,500rpm. With a specific output of 6.8b.hp/ci, it represented one of the most powerful engines for its size of all time—on only 15-percent-nitromethane fuel!



Henry Nelson's updated AAC Q40 ranks near the top of all engines tested in terms of torque per pound of engine weight.

THE NEW Q

Several months ago, Henry Nelson suggested that I return the "Q" for updating. Sensing that something important had occurred in the dynamic field of 2-stroke engine development, I rushed the still pristine engine back to its place of origin; when it returned, it looked the same—on the outside.



One-piece, investment-cast, twin-ball-bearing, aluminum-alloy crankcase with front rotary-shaft induction and side exhaust.

After an appropriate break-in period (on the bench, of course), the engine was mounted to my trusty dynamometer to see if anything had changed in three years. Maybe I was lucky; the data retrieved produced nice, smooth (textbook-like) torque and b.hp curves with very little scatter. After closely examining these curves, it becomes apparent that the state of the art has been advanced another notch; peak power now extends to 2.9b.hp at 21,100rpm—an increase of more than 6.5 percent, and the all-telling specific output has improved to 7.33b.hp/ci!

After removing the engine from the dyno, I retreated to the quiet confines of the RPM workshop where the engine was carefully disassembled for cleaning and measurement. *Note: correct reassembly depends on marking the forward (or rearward) facing direction of individual components; e.g., connection rod, piston, cylinder head.* The crankshaft is press-fit

SPECIFICATIONS

Cylinder displacement: 0.3954ci/6.48cc
Bore: 0.846 in./21.488mm
Stroke: 0.7035 in./17.869mm
Bore/stroke: 1.20/1
Stroke/bore: 0.83/1
Conrod length: 1.3375 in./33.973mm (center to cent
Conrod/stroke: 1.90/1
Combustion-chamber volume @ TDC: 0.42cc
Compression ratio—geometric: 16.4/1
—effective: 11.1/1
Carburetor bore: 0.345 in./8.763mm
Crankshaft thread size: 5/16-24
Weight—bare: 12.2 oz./345.6g
—w/muffler: 15.8 oz./448.6g

PERFORMANCE

Maximum torque: 137 oz.-in.
Maximum b.hp: 2.90 @ 21,100rpm
B.hp/ci: 7.33
B.hp/lb.: 2.94
Oz.-in./ci: 346.5
Oz.-in./lb.: 138.7

NOISE LEVEL

Muffler/tuned pipe: 114dB
Fuel: 15-percent-nitromethane; 20-percent lube
Propeller: Rev-Up 8¾x6½ (Series 400c)
Rpm: 20,000

Sound meter: Radio Shack no. 33-2050
Meter setting: "A" scale; slow response
Distance from engine: 9 feet

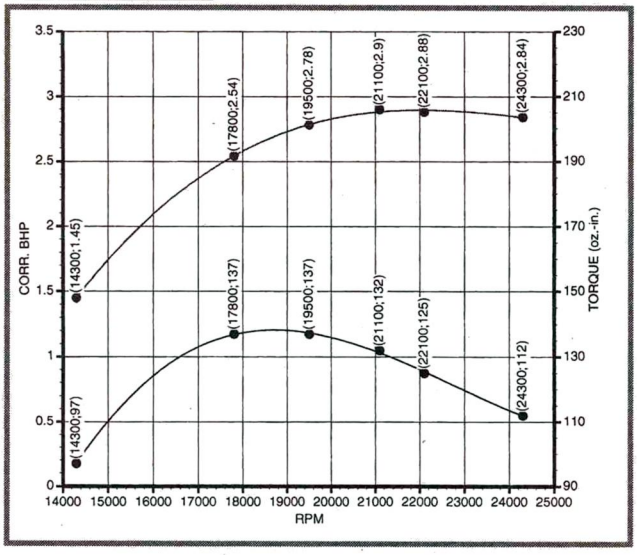
PORT AND INLET TIMING

Exhaust
Opens: 83° BBDC
Closes: 83°ABDC
Total open: 166°

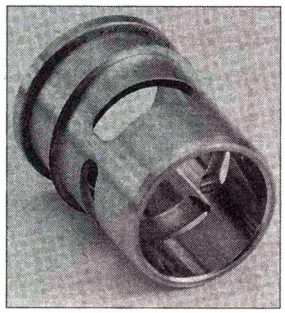
Boost and Transfers
Opens: 65°BBDC
Closes: 65° ABDC
Total open: 130°

Inlet (induction)
Opens: 40° ABDC
Closes: 65° ATDC
Total open: 205°

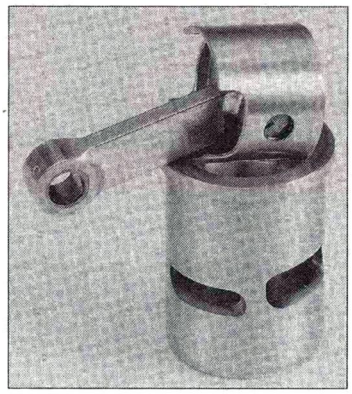
SUMMARY
Like most top-of-the-line engines from around the world, the Nelson AAC Q40 uses state-of-the-art, space-age technology throughout its construction. The difference between the Nelson and all the rest is performance; 7.33b.hp/ci says it all!



into the rear and front ball bearings, which are located in the crankcase; this ensures that it won't slip in the bearings' inner races, causing friction and heat. I recommend that you *don't* remove and replace the shaft; the operation must be performed precisely, using the correct equipment (a press), or damage may be inflicted to the delicate bearings. If you crash the engine and think there's dirt in the bearings, return it to the factory; chief assembly and repair technician Gary Gau will quickly and expertly perform the required tasks.



Chromed-aluminum sleeve. Note the brass shim used to raise the unit in the crankcase, thus altering the transfer and exhaust port timing.

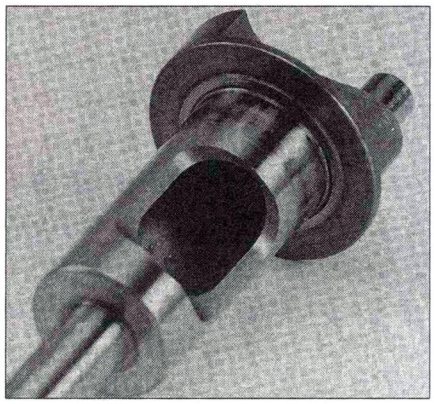


Silicon-aluminum piston with its chrome-plated, aluminum-alloy sleeve (AAC). The wristpin is retained in the piston by wire retainer clips. Both ends of the connecting rod are brass bushed.

WHAT'S INSIDE?

Our test engine is fitted with an AAC (aluminum piston; aluminum liner-chromed) piston and liner assembly; as mentioned earlier, the 1992 version was equipped with the ABC (aluminum piston; brass liner-chromed) unit. When I asked Henry which P&L (piston and liner) combination was the best, he replied, "I think they run about the same; some guys swear one type is faster than the other, but I've never been able to measure it. Personally, I like the AAC unit because it's lighter."

With a bore of 0.846 inch and a stroke of 0.7035 inch, the cylinder displacement calculates to 0.3954ci—less than 6.5cc. With a large bore and relatively short stroke, the engine is over-square with a stroke/bore ratio of 0.83 to 1; this compares favorably with other modern high-speed, high-power, 2-stroke glow engines. With a long connecting rod (1.3375 inches), the rod length to stroke ratio is a high 1.9 to 1; this reduces the degree of rod angularity at mid-stroke in reference to the vertical center line of the engine, thus reducing

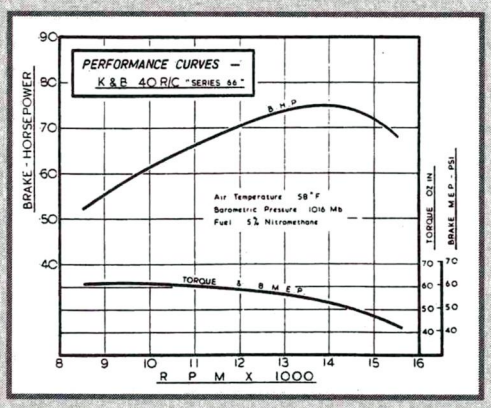


Notice the huge induction hole in the crankshaft.

THIRTY YEARS AGO

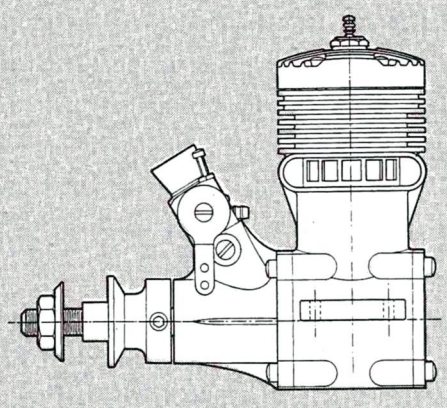
K&B .40R/C Series 66

Readers may find it interesting to compare this month's review engine with the initial trendsetter for the 6.5cc class. Originally tested for *Model Airplane News* by longtime engine columnist Peter Chinn, the new K&B* (1966) was touted as the "hottest Goodyear class unit to date." "Goodyear" referred to the new R/C pylon racing event that allowed a .40ci displacement limit. This event inspired engine manufacturers from around the world to produce .40ci glow engines for an expanding model-aviation market.

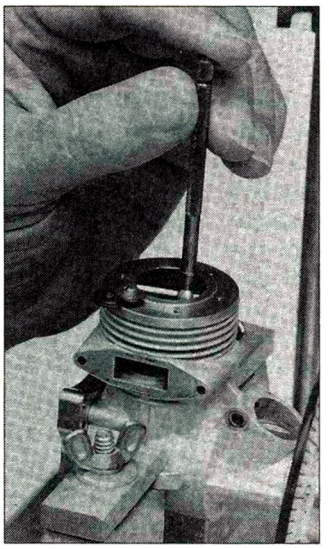


K&B's Torpedo

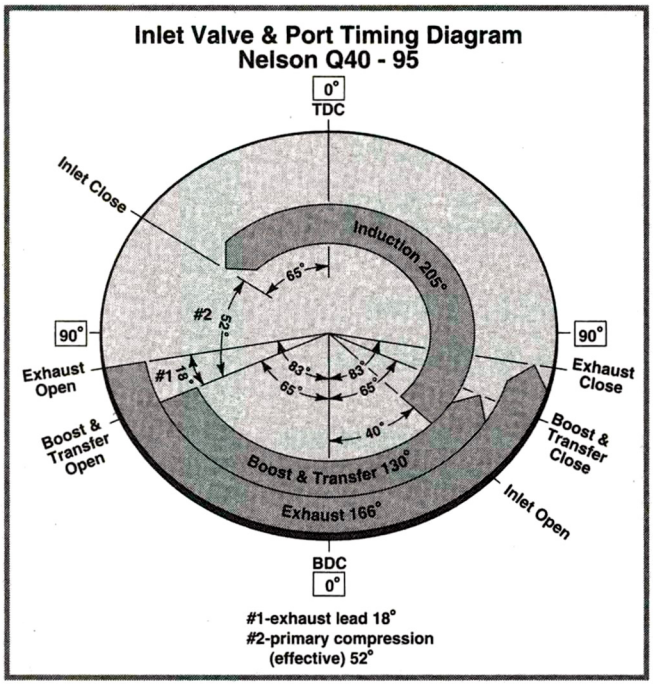
The unique feature of the Torpedo was its special L-section, low-tension, cast-iron piston ring; it was installed flush with the top of an aluminum bar-stock piston where it promised lightweight, low-drag operation. K&B employee Jim Nightingale invented this variation of the Dyke's ring, which was extensively tested in several bar-stock prototype engines of the era. These were used for control-line speed competition by him and Bill Wisniewski—legendary K&B engine designer. Many national records were established, proving the merits of the new ring; the .40R/C Series 66 represented the first use of the system in a production engine.

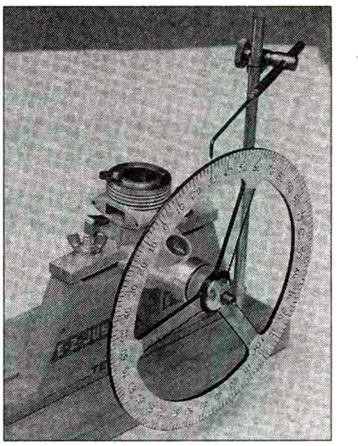


Mr. Chinn described the K&B



Using a telescoping gauge to measure the cylinder bore.



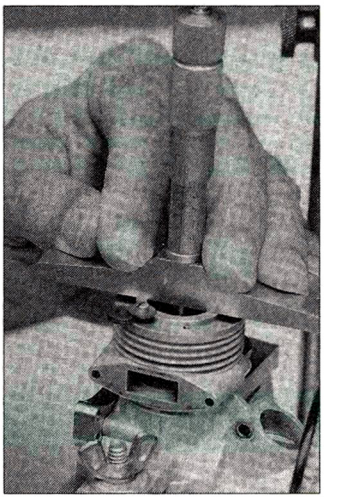


The degree wheel is mounted to the crankshaft in preparation for measuring the port timing. Notice the music-wire pointer.

unwanted piston side-thrust and friction.

The most surprising aspect of the Nelson Q40 design is its high compression ratio (cr). Measured from exhaust-port closure, the (effective) cr is 11.1 to 1—the highest of any mass-produced engine surveyed to date. Many reworked racing engines have high compression ratios, but few behave as sedately when adjusting the needle valve as the Q40. I was mildly surprised to find the carburetor bore only 0.345 inch, especially when the engine is developing almost 3.0b.hp; then I remembered: there's a competition rule concerning the maximum carburetor bore size!

Although racing engines aren't known for their ability to generate great amounts of torque, the Q40 ranks near the top of all engines tested in terms of torque per pound of engine weight (oz.-in./lb.). Long exhaust and transfer/boost-port open periods coupled with an equally long rotary-shaft induction-valve period (205 degrees) usually spells doom to effective trapping of air-fuel charge in the cylinder, especially at high shaft speeds. However, the Nelson Q40 does an admirable job of converting this charge into high cylinder pressures (mean effective pressure), which translates into high shaft torque per pound of engine weight.



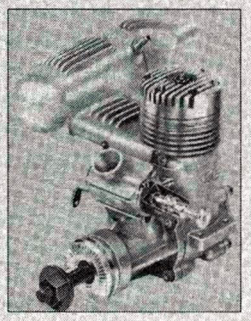
Using the depth micrometer to measure the stroke.

On the negative side, the Q40 is loud; high noise levels always seem to erupt from high-speed engines—114dB at 9 feet. System noise was measured using a typical flight propeller (Rev-Up 8.75x6.5 Series 400c) turning 20,000rpm at the maximum power air-fuel ratio; this is important. Sound-check cheating has occurred in competition events that have noise limits. Here's how the scam went: before contest organizers became technically aware, some contestants installed oversize propellers and ran the engine on the rich side of 2-cycling; this produced a noticeable reduction at the dB meter while the engine appeared to be working hard. Today, noise checks are made just before takeoff, with no opportunity to change propellers.

PROP NOISE

For the fun of it, I performed one additional test: propeller noise was eliminated by running the engine on a flywheel (no propeller) and braking its speed with a leather strap to the previous shaft speed of 20,000rpm (see "Hey, Keep the Noise Down," *Model Airplane News,* December 1995). The new noise level was surprisingly low—93dB! With an 11dB difference, the propeller is swamping all other sources of

as "an extremely powerful contender in its class." Operating on 5-percent-nitromethane fuel, the engine produced 0.75b.hp at 14,000rpm. A casual comparison of the torque and horsepower curves for the Nelson Q40 and the K&B .40 will illustrate how far miniature 2-stroke technology has progressed in three decades! The K&B .40 is still with us today; known as the no. 4011; the updated version of the Series 66 is still an excellent engine, offered at a bargain price. Several clubs around the country still use the K&B .40 as the required engine for novice Quickie 500 racing, where costs are kept to a minimum, but the racing is still exciting.



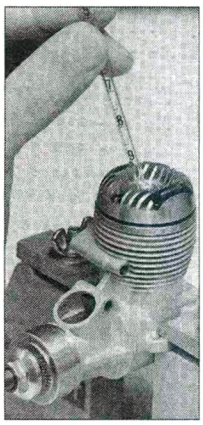
Current no. 4011

Nelson Q40-'95

RPM	TORQUE	CORR. BHP	BHP	CORR. FACTOR	DISTANCE	Coefficient	59.3
14000						Wet Bulb (F)	65
14300	97	1.45	1.38	1.05	1.632	Dry Bulb (F)	75
17800	137	2.54	2.42	1.05	2.305	Bar Pres (Hg)	29.34
19500	137	2.78	2.65	1.05	2.317	Vap Pres (Hg)	0.5
21100	132	2.90	2.76	1.05	2.226		
22100	125	2.88	2.74	1.05	2.1		
24300	112	2.84	2.70	1.05	1.889		
25000							

noise in the system, including the muffled exhaust!

We need a breakthrough in propeller design. Quiet propellers are desperately needed; is it possible? If not, we'll have to design engines that run slower; it seems a shame doesn't it? We assume the villain is the exhaust when it's really propeller noise. Where might engine-propulsion systems be headed?



Determining the clearance volume of the engine by filling it with low viscosity oil from a measuring pipette, to the nearest 1/100ml. This measurement is used to calculate the compression ratio.

I SUGGEST GEAR-DRIVE

With the tremendous specific output (b.hp/ci) of the Nelson engine, imagine it coupled to an efficient helical gear speed-reduction unit, turning an output shaft between ½ to ⅓ crankshaft speed. Torque doubling or tripling would allow propeller diameters of 16 to 20 inches to be turned at shaft speeds between 7,000 and 10,000rpm.

We know that exhaust noise intensity can be reduced up to 99 percent with a good muffler; prop noise isn't a problem when turned at less than 10,000rpm. With the engine operating happily at peak b.hp, swinging large, thrust-producing propellers—quietly—what else could you want? I believe these relatively lightweight units would easily compete with converted chain-saw engines on large models.

You say that you've heard it all before? It's true, Webra* and O.S.* produced gear-drive units in the early 1980s; they worked fine, but their 10cc (.61ci) engines could only produce about 2.00b.hp/ci. The Nelson Q40 delivers more than *three times* that amount!

Because of his leadership in the field, I'd like to challenge Henry Nelson to design and manufacture an integral gear-drive unit for the Q40 and show the industry what's really possible with quiet, high-performance 2-stroke cycle engine technology!

*Addresses are listed alphabetically in the Index of Manufacturers on page 151.

Maximize your performance with energy management

MODEL AIRPLANE NEWS HOW TO

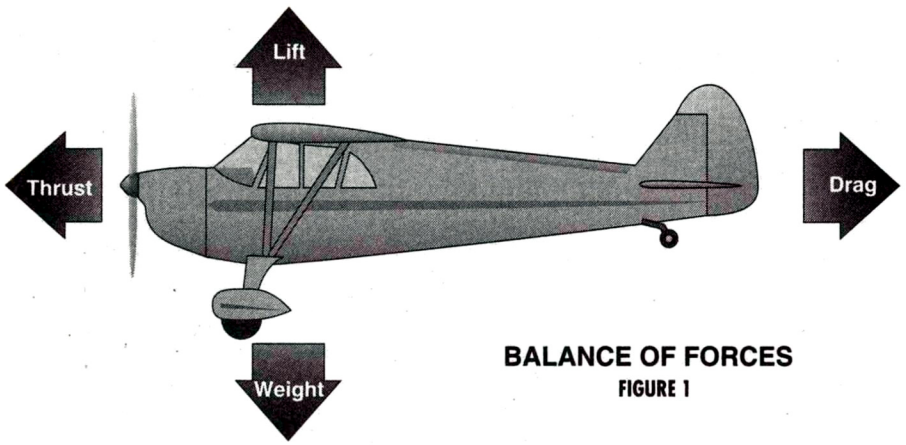
The Art of Low-Power Aerobatics

by KEITH SHAW

AT ANY air show, you'll see many styles of flying. The public's favorites always seem to be the speed, thunder and close-quarter flying of the jet teams and the brutal precision of planes such as the Pitts, Laser, Extra and Sukhoi as they effortlessly perform intricate dances, without any apparent regard for gravity. My favorite acts, however, are those by stock or slightly modified "standard" aircraft flown on meager power, but still doing excellent aerobatics. I know that I am watching a real pilot who uses finely honed skills and senses to push the plane to the limit in pursuit of performance. My heroes include Bill Barber, Art Scholl, Duane Cole and Bob Hoover, so it should be no surprise that I try to emulate them when I fly replicas of their aircraft. This type of flying requires quite a different mindset from the usual one; you spend much more time "listening" to your plane than demanding that it follow your commands. Controls are squeezed rather than slammed, while everything possible is done to minimize drag; and, surprisingly, gravity becomes a very important *ally!*

While I find the pursuit of efficiency in aerobatics extremely gratifying in its own right, there are other reasons to learn these techniques. I've seen many a crash at a crowded, noisy airfield because the pilot didn't know his engine had quit. If the pilot had been paying attention to his aircraft's speed or handling characteristics instead of to the engine noise, a safe dead-stick landing could have saved the plane. For competition fliers, a crucial flight score might be salvaged even with a bad engine run. Electric fliers will gain great rewards, because efficient flying can dramatically reduce power consumption and extend flight time.

The biggest benefit, however, will be in learning to be a better pilot. After a while, the continuing observation of the subtle visual cues and control interactions will become second nature as you develop a "feel" for the aircraft. At that point, the loop is complete, and you are now a real pilot, completely unaware of the transmitter in your hands.



BALANCE OF FORCES
FIGURE 1

A LITTLE BIT OF PHYSICS

Please, don't be frightened! I promise not to snow you under with any equations, but there are just a couple of concepts to be discussed.

■ **The balance of forces.** I think everyone has seen the sketch of an airplane in level flight when lift equals weight and thrust matches drag (see Figure 1). Though this is pretty simplistic, it will serve for our purposes. Assuming the plane is in level flight, an increase in thrust will cause an acceleration, and the speed will increase until the drag rises to just equal the thrust. At this point, the forces are once again in balance, only the plane is flying somewhat faster. If the lift is increased, either by an increase in camber or an increase in the angle of attack, the plane will climb, or it could be made to carry more weight in level flight.

Unfortunately, things aren't this simple. The balance-of-forces concept implies that there is no interaction between the lift/weight and the thrust/drag components. The drag that most people think about is called *"form drag"*; it includes bulky fuselages, rigging, struts, exposed landing gear and engine cylinders. This type of drag gets worse as speed increases, and it's the major force that limits an airplane's top speed.

The "hidden" drag is called *induced* drag, and it's the penalty incurred in exchange for lift. The total lift of a wing (or any flying surface, for that matter) is dependent on its area, air speed and the airfoil's coefficient of lift (basically, a measure of how hard the airfoil must work to produce lift). The harder it has to work, the higher the lift coefficient and, unfortunately, the higher the induced drag. When a plane is flying fast, the necessary lift coefficient is quite low, so the induced drag is also low. That's why most pylon racers have very low-cambered airfoils—usually, just enough to produce the necessary extra lift for a turn. At low speeds, however, induced drag is the dominant type of drag, because the airfoil has to work very hard to create lift. To get the most efficient glide possible, sailplane designers go to excruciating lengths to choose and construct a wing that will produce the best lift-to-drag ratio. So we see that our lift force in the balance picture is coupled with the thrust/drag relationship. At slow speeds, especially near stall, induced drag can dramatically affect how a plane handles.

■ **Conservation of energy**—the other physics lesson, and it's probably the most important tenet in flying aerobatics. A plane's potential energy is related to the height it is flying above the ground, while its kinetic energy is a function of speed.

In a perfect world without drag, the potential energy added to the kinetic energy would be a constant. This perfect plane would fly at a constant altitude indefinitely, without needing a motor. If

it dove to lose altitude (decrease in potential energy), it would gain speed (increased kinetic energy) to keep the total energy constant. It would roll effortlessly and loop perfectly, and entry speed would be exactly the exit speed. For an un-powered aircraft in the real world, however, drag acts as an energy siphon that gradually decreases the plane's total energy. To even maintain a constant air speed, it would have to slowly lose altitude, and the extra drag of aerobatics would lead to even more altitude loss. As an example, a loop could be performed in two ways: by exiting at the same altitude and a lower air speed, or at a slightly lower altitude with the same air speed. But by allowing this slight altitude loss, a properly trimmed and flown glider can do *any* aerobatic maneuver. If we install a small power system that can just replace the energy lost owing to drag, our plane can maintain altitude and perform aerobatics. With even more power, it could gain altitude and still hold a given air speed. Of course, we could get silly and become a Sukhoi, with enough horsepower to reach terminal speed while going straight up! But rather than solving the problem with excessive energy input, we can get much of the same effect by learning to control and minimize drag and, thus, reduce our energy requirements.

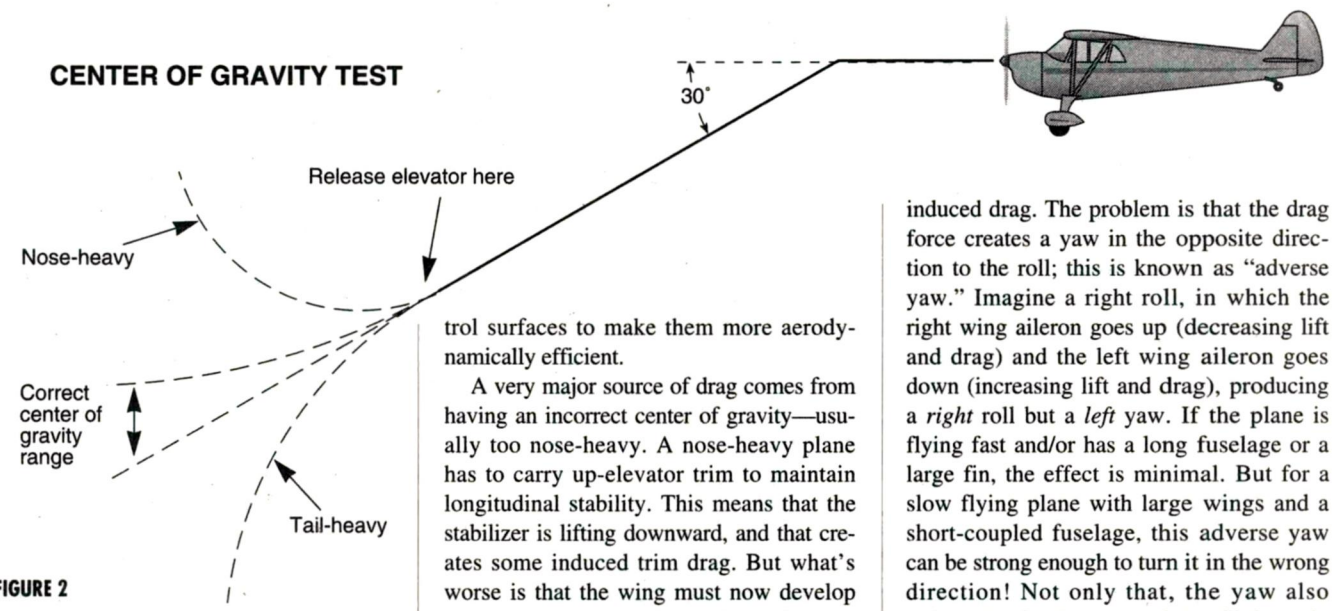


FIGURE 2

CONTROLLING DRAG

On a scale airplane, little can be done to reduce form drag, but there are several ways to reduce induced drag. As control surfaces are moved off neutral, they do not deflect the air as most people think, but they change the airfoil's camber, thereby changing the lift coefficient and unfortunately, the induced drag. If a plane has any warps, most modelers just offset the appropriate control surface. This causes induced trim drag, so it's much better to remove the warps. Similarly, if the plane is not laterally balanced (one wing is heavy), it will require aileron and rudder trim to compensate, and, of course, this means unwanted drag. So that less control throw is needed, I also always seal the hinge line on all control surfaces to make them more aerodynamically efficient.

A very major source of drag comes from having an incorrect center of gravity—usually too nose-heavy. A nose-heavy plane has to carry up-elevator trim to maintain longitudinal stability. This means that the stabilizer is lifting downward, and that creates some induced trim drag. But what's worse is that the wing must now develop even more lift to maintain level flight—incurring even more drag! A little longitudinal stability is desirable for comfortable flying, but most kits and plans are highly overstabilized.

Test your plane for correct CG using the following method (see Figure 2):

- Fly at half throttle and adjust the elevator trim until the plane can maintain hands-off level flight. Check this by making several passes without changing the throttle. You should be flying at an altitude of 100 to 150 feet.
- When the plane is nearing center stage, gently push it into a 30-degree dive, and hold it until the air speed has increased noticeably. At this point, take your hand off the stick and observe what happens.
- If the plane pulls up sharply, it's very nose-heavy. If it continues in the dive or pulls up slightly, its CG is just right. If it tries to tuck under, it's tail-heavy.

A bunch of extra advantages come with having a correct CG location. The amount of elevator throw necessary for any maneuver will decrease, and that will mean less control drag. There will be virtually no need for downthrust, which is an inept attempt to "fix" an over-stabilized aircraft's tendency to nose up as power is increased.

Another source of induced drag comes from trying to convince the wing to roll. Every method works by differentially changing the lift of the wing panels. Standard ailerons deflect to increase the camber (and lift) on one panel and decrease it on the other. Of course, the change in lift also causes a change in induced drag. The problem is that the drag force creates a yaw in the opposite direction to the roll; this is known as "adverse yaw." Imagine a right roll, in which the right wing aileron goes up (decreasing lift and drag) and the left wing aileron goes down (increasing lift and drag), producing a *right* roll but a *left* yaw. If the plane is flying fast and/or has a long fuselage or a large fin, the effect is minimal. But for a slow flying plane with large wings and a short-coupled fuselage, this adverse yaw can be strong enough to turn it in the wrong direction! Not only that, the yaw also swings the fuselage out of the flight path, causing a huge increase in drag. A vast amount of effort has gone into trying to tame this demon—using tricks such as differential aileron throw; aileron/rudder coupling; specially shaped ailerons that put out a drag-increasing "foot" on the up-going motion; and various spoilers and yaw flaps. The glitch is that all of these methods only help for upright flight, but they severely worsen the problem when a plane is inverted. The all-around best method is to learn to fly coordinated rudder, keeping the fuselage in line with the flight path and drag to a minimum.

PRACTICING SLOW FLIGHT

When a fast, highly powered aircraft performs aerobatics, it is usually well above stall speed. Snap rolls, Lomcevaks and other violent contortions are generated by forcing a high-speed wing stall. But for low-powered airplanes, the usable speed envelope includes speeds just barely above stall, such as near the top of a loop or Immelmann. Before performing such maneuvers, it's best to practice slow flight to learn how the plane's handling characteristics change. Most modelers think that flying near stall speed is inviting certain

disaster, but in truth, most planes are quite benign. Of course, extremely high wing loadings, warped wings and poorly crafted airfoils can degrade the stall handling characteristics.

To begin, fly at 150 to 200 feet while practicing a racetrack or lazy figure-8 pattern, and gradually decrease the power on each pass. Several things will become apparent at well above stall speed. Aileron authority will diminish and become sloppy, and adverse yaw will be much more noticeable, but fortunately, rudder control will usually stay solid all the way down to stall.

If the ailerons become too sloppy, try flying with rudder. Some planes, particularly those with barn-door ailerons, may experience "aileron reversal" at slow speed. What happens is that for a right-aileron turn, the down-going surface on the left wing panel effectively pushes the airfoil past stall. The loss of lift drops the left tip, making it seem to roll to the *left*. My Gee Bee R-1 is notorious for this, so once it's turned onto final and begins to slow down, I never touch the ailerons, but fly it strictly on rudder.

Just above stall, elevator control fades, and the forward speed will rapidly drop owing to the very strong induced drag (high lift coefficient means high drag); the plane will mush forward and lose altitude. Stall recovery is best effected by applying slight down-elevator and increasing the power gradually. This decreases the induced drag and allows the wing to start lifting again, after which gradual up-elevator can be applied to return to level flight. With some practice, a plane can be flown continuously and carefully in a partial stall condition, usually with a little more power to compensate for the high induced drag.

As you become more confident, you'll appreciate the value of flying coordinated rudder to control adverse yaw, because you'll be able to turn and maneuver at much lower speeds. Flying lower will help to set these skills. It is also beneficial to do the same training inverted, particularly to help suppress the panic up-elevator response. Recovering from an inverted stall is almost the same as flying right side up, but you use slight *up*-elevator to get out of the stall.

Another anomaly occurs when trying to climb at slow speed: the plane tries to yaw to the left and needs right-rudder correction. This happens to any single-engine airplane with a right-handed-rotation propeller. This is *not* due to torque, gyroscopic precession, or circular airflow, but to an effect called the "P-factor." When a plane is in a slow-speed climb, the entire airplane—including the engine shaft—is at a high angle of attack. The descending propeller blade on the right side of the center line is at a higher angle of attack than the ascending blade, so it produces more thrust. This offsets the prop thrust to the right of the center line and yaws the plane to the left. When tail-draggers veer to the left on takeoff, it's because of the P-factor.

Kit designers try to help by building right thrust into the engine mount in an attempt to counteract the P-factor. But the yaw force is to the *right* when the plane is inverted, so the built-in right thrust just makes the problem worse, and it would require a lot of drag-producing left-rudder correction to overcome it. Understanding the source of these forces and learning to give the correct control inputs result in lower overall drag through maneuvers.

ENTRY AIR SPEED FOR LOOPS

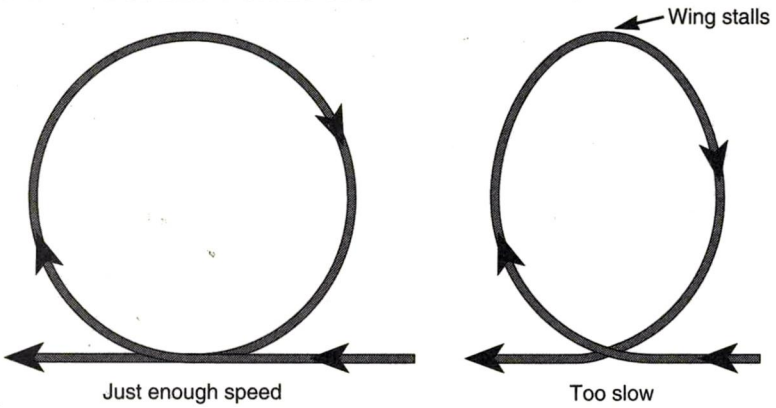


FIGURE 3

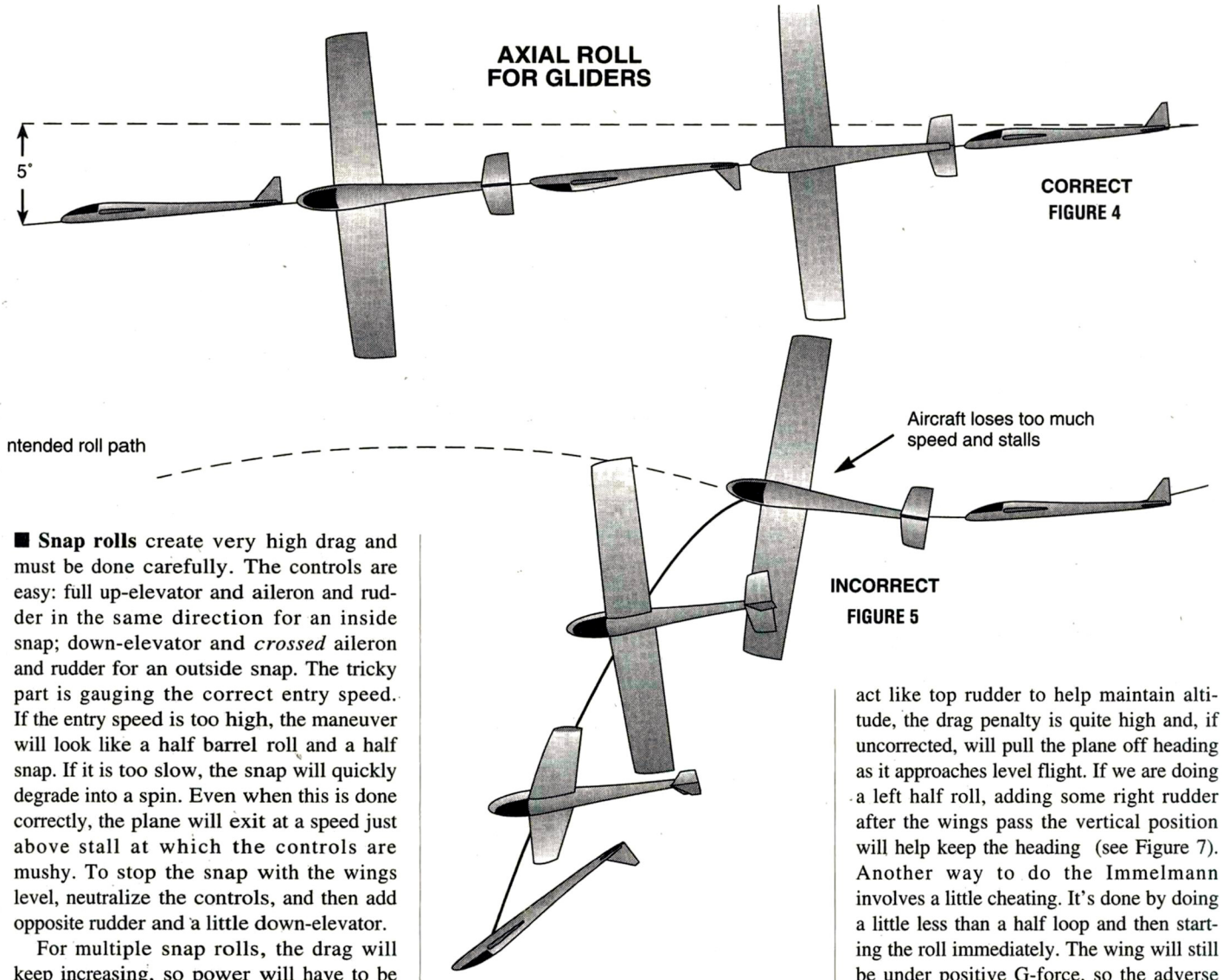
SIMPLE AEROBATICS

All basic maneuvers with the same entry and exit altitude—including loops, rolls, point rolls, figure-8s and stall turns—can be done with little horsepower. The only limitation is that the air speed must not drop below stall speed anywhere in the maneuver. A nice, round loop requires an entry speed of about twice stall speed. Higher entry speeds allow an increase in loop diameter. An entry speed that's too low will result in a stall, which makes a loop out of round at the top (the classic "Cub" loop is an example of this; see Figure 3). It's important to control the elevator smoothly to create a circular shape. The direction and amount of elevator throw will depend on a lot of factors, such as airfoil, downthrust, tail area and wind direction. Don't forget to use right-rudder correction on the upward part, if necessary, to control the P-factor. Gliders and really low-powered aircraft may need to gain sufficient speed before entering the loop by performing a shallow dive.

Rolls need only enough extra power to overcome the added drag from the control inputs. For slow rolls, top rudder will certainly help to keep the roll straight, but at a high drag cost, as we're asking the plane to knife-edge in the first and third quadrants. Knife-edge flying is done with the wings vertical while using the fuselage as the wing—certainly a spectacular but very high-drag configuration!

Try to resist the urge to pull the nose of the plane above the horizon with rudder. Smaller corrections will still help, but they'll create much less drag. In point rolls, it's important to gently squeeze the aileron controls to prevent adverse yaw from starting a yaw oscillation. This not only looks bad, but it's also very difficult to damp out. The aileron input should be more like a sine wave than a set of staccato pulses. For gliders and very low-powered planes, the loss of energy caused by control drag may be offset by performing the roll on a shallow downward line (usually no more than 5 degrees; see Figure 4). Do not pull the nose of the plane above the horizon at any part of the roll, because the drag could increase so quickly that air speed will drop below stall speed, and the plane will literally fall out of the sky (see Figure 5).

Cuban-8s can be done by allowing an altitude loss of about 5 feet on each half to compensate for the control losses. Even a pattern judge would have a difficult time spotting this loss. For stall turns, smoothly transition into the vertical and leave the engine at full power, not only to get the best possible height, but also to maintain rudder effectiveness. After the yaw has been initiated, the power can be reduced if you want to slow the descent.



■ **Snap rolls** create very high drag and must be done carefully. The controls are easy: full up-elevator and aileron and rudder in the same direction for an inside snap; down-elevator and *crossed* aileron and rudder for an outside snap. The tricky part is gauging the correct entry speed. If the entry speed is too high, the maneuver will look like a half barrel roll and a half snap. If it is too slow, the snap will quickly degrade into a spin. Even when this is done correctly, the plane will exit at a speed just above stall at which the controls are mushy. To stop the snap with the wings level, neutralize the controls, and then add opposite rudder and a little down-elevator.

For multiple snap rolls, the drag will keep increasing, so power will have to be added to prevent the plane from transitioning into a spin. If a snap roll is incorporated into another maneuver, such as the avalanche (loop with a snap at the top), a higher entry speed will be needed to prevent the snap roll from dropping the air speed too much and causing the loop to become asymmetric (see Figure 6).

■ **Spins** are easy to do: at partial power, approach a stall, then add in up-elevator and rudder and ailerons in the same direction. If all you get is a spiral, try putting in rudder first, and when you see the yaw, add full up-elevator. When the wingtip stalls, dump in the ailerons. Some aircraft will spin without needing ailerons, but I find that the entry and exit are much more unpredictable and sloppy. Spin exit usually just requires that you release the controls, let the nose drop, gradually add power and return to level flight. If it's a little stubborn, keep the aileron and elevator neutralized, but feed in some rudder in the direction opposite the spin. When rotation ceases, add power and continue with the normal exit. Inverted spins are done similarly, but with down-elevator and the aileron and rudder controls crossed. Even gliders can spin, but air speed has to be a little higher because there's no prop blast on the tail. The rudder/elevator/aileron sequence seems to work best.

■ **Altitude-gaining maneuvers** will always have a lower exit speed than they had at the start. Probably the hardest stunt to do well on low power is the Immelmann. Right when the speed is lowest and the P-factor is strongest, the plane will need to transition into inverted flight and then immediately try to do a half roll! Certainly, some extra entry speed would be very helpful, but the biggest problem is not in doing the half roll, but keeping the heading. Even though the adverse yaw tries to act like top rudder to help maintain altitude, the drag penalty is quite high and, if uncorrected, will pull the plane off heading as it approaches level flight. If we are doing a left half roll, adding some right rudder after the wings pass the vertical position will help keep the heading (see Figure 7). Another way to do the Immelmann involves a little cheating. It's done by doing a little less than a half loop and then starting the roll immediately. The wing will still be under positive G-force, so the adverse yaw will prevent the nose from hanging above the horizon; and it will be in the correct direction to help hold the heading. The nice thing about this method is that it does not require any rudder corrections.

■ **Vertical roll**—one of the neatest maneuvers (usually considered a "macho-power" maneuver). With enough energy from a dive, even a glider can do one (my own record is *six* vertical rolls with a 2-meter slope glider). Once again, the roll part is relatively easy, but the transition back to level flight requires great care, due to very low air speed and massive P-factor effects from the prop. When pushing the nose down toward level flight, the plane is under substantial negative-G, so you'll need some left rudder to hold the heading. When the plane is level, the elevator must switch smoothly over to up, and because the plane will enter positive-G, the rudder correction has to switch to the right. Trying to hold level flight just above stall speed while trying to keep the

heading and letting the plane gain speed is a fine balancing act. The "flub" that can occur is an unwanted spin caused by too low a speed and the up-elevator and right-rudder corrections. No problem! Just release the controls, do a normal spin exit, gain altitude and give it another try.

ENERGY MANAGEMENT

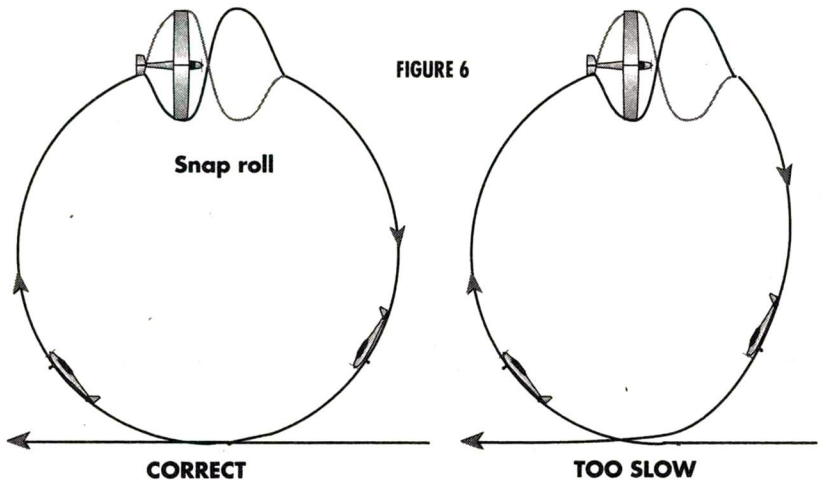
Now that you have practiced the individual maneuvers, it's time to link them into a pleasing air show. Probably the most time- and space-efficient format for aerobatics is the "turnaround" layout in which maneuvers are performed at center stage and at both ends of a box. Some maneuvers are naturals for center stage; these include loops, rolls, point rolls, various figure-8s, and any maneuver that does not produce a change in direction. Direction-changing maneuvers, such as the stall turn, the Immelmann, split-S's, or half Cuban-8s, work best at the ends of the box.

The size of the box will depend on the energy available. Huge loops performed 1,000 feet away may be the standard in pattern flying, but they are rarely suitable for scale air shows. The huge maneuvers not only require vast amount of power, but they also take longer to complete, so fewer can be done in a fixed time or energy allotment (such as with electric power). Flying closer with smaller maneuvers can look the same while saving a lot of energy; the only drawback is that errors will be more visible. A good box length is about six times the diameter of a comfortable loop. Some maneuvers can be altered to give the box some depth, but you should practice imagining a barrier on the near edge that *never* allows the plane any closer to the audience.

To make best use of the available energy, try to link maneuvers with matching entry and exit speeds, and practice them as a sequence. An example might be a loop at center stage, a stall turn at the turnaround, then a four-point roll, followed by a half Cuban-8. The result will be that you are in the same position on the same heading with about the same energy.

Another sequence can be created and practiced and added to the previous one, until a satisfying air-show routine emerges. If an altitude-gaining maneuver such as an Immelmann is used, the energy in the extra altitude can be invested in diving to get a higher entry speed for the maneuver that follows—a super-slow roll, avalanche, or vertical roll, or on an altitude-losing one—a spin or split-S. If the plane is getting too low, one of the turnaround maneuvers could be replaced with a climbing 180- or 540-degree turn.

The last major hurdle will be learning to fly your routine in real-life condtions—invariably crosswind or with heavy turbulence. With low power and speeds, their effects will be much more severe than normal. I suggest that you start with basic slow-flight practice and learn how the wind affects flight characteristics. Although I don't want to get into the "downwind turn" fiasco, I will tell you that making turns in a moving air mass using a plane with a finite acceleration can lead to some *very* exciting flying, so start with a little extra altitude. Under these conditions, I raise my base line for aerobatics by at least 30 feet. In crosswinds, the aerobatic flight line will drift, so corrections will constantly be needed. Initially, the corrections can be applied after each maneuver, but eventually, they can be blended into the maneuvers themselves. For example, an uncorrected loop in a crosswind becomes a helix, but carefully adding rudder toward the wind will keep it straight. Keep practicing in all types of weather; it will make you a much better pilot.



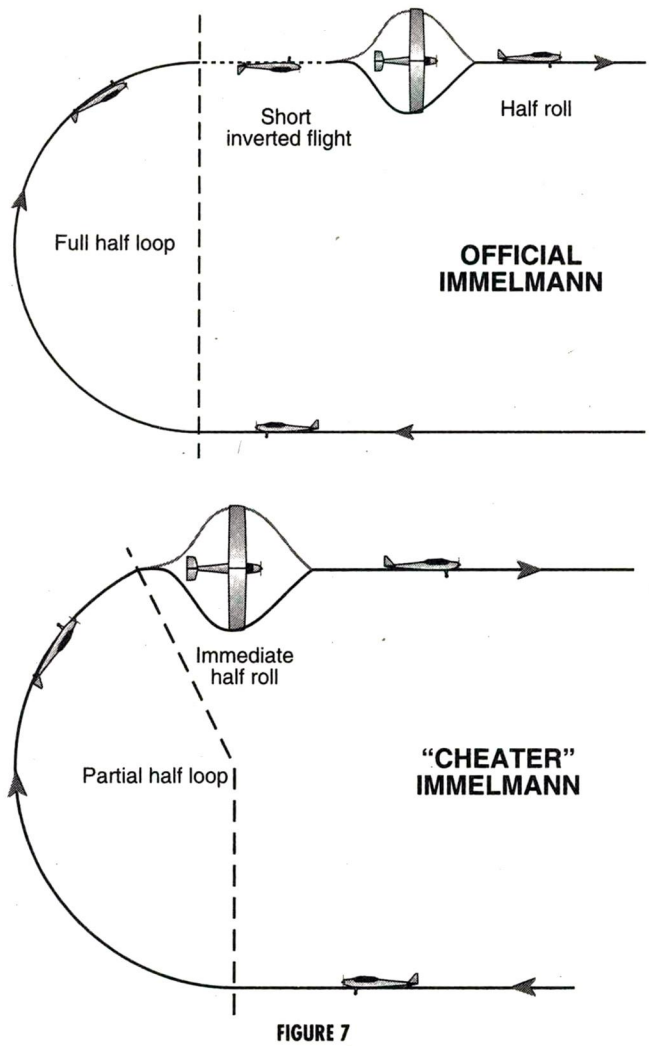
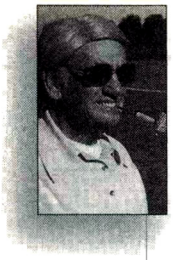


FIGURE 7

FINAL THOUGHTS

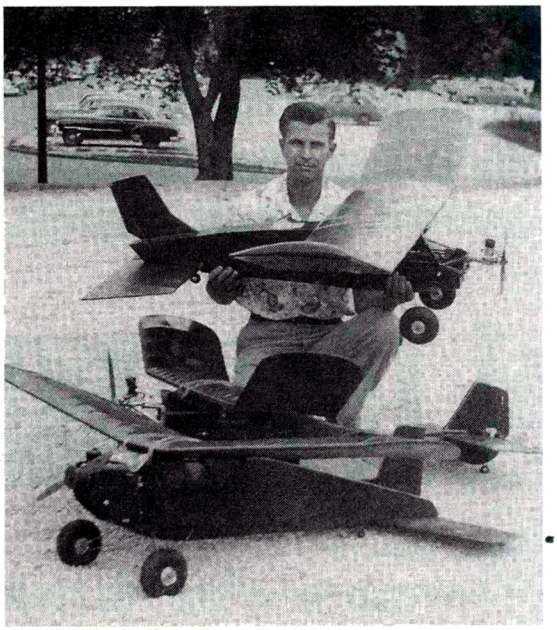
Well, the path to success in flying low-powered aerobatics is before you. With much practice, careful analysis and diligent effort, you will become a real pilot. At that point, you will also know how to fly any plane in any conditions, as you'll need smaller corrections as power and speed go up.

I hope to see you at the air shows. If you have any comments or questions, you may write to me, but please include an SASE: Keith Shaw, 2756 Elmwood, Ann Arbor, MI 48104.



by HAL deBOLT

FROM THE OT R/C MAILBAG



Paul Johnson of Des Moines, IL, with his stable of airplanes. Paul helped write an article describing the three-tube receiver he developed.

AS YOU CAN probably guess, much of the history in these chronicles has been recounted with the bias of my experience and knowledge, and with much input from others, of course! One historical viewpoint comes from Bill Broadley of West Chester, PA. Bill is a retired Bell-Boeing helicopter design engineer who devoted much time to Experimental Aircraft Association activities, and he was introduced to R/C in 1936. Now an aerodynamicist, he's still involved with R/C, and he's also designing a full-scale, two-place pusher with which he hopes to break records. Recently, he tried his hand at R/C modeling and found that it isn't a snap; air time was no problem, but old skills needed to be honed in particular areas. Join the crowd, Bill! Here's his meritorious tale.

BILL'S VIEWS

"The golden age of R/C must have various dates of origin. Jesse Bieberman, a teacher in Philadelphia, was involved with a large, high-wing, R/C model between 1936 and 1937. That, for me, was an official beginning, because I watched him build and adjust his radio. I saw the completed craft once, but I'm sorry that I never saw it fly.

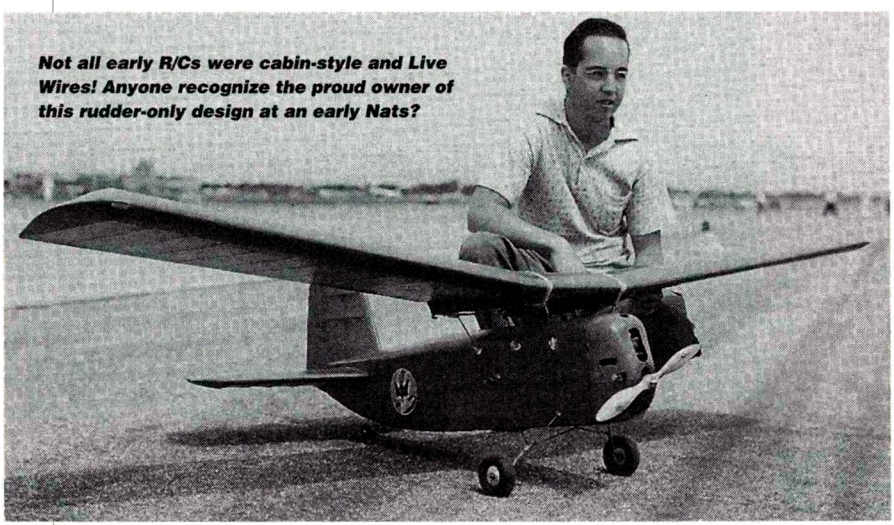
"Elderly R/C fliers today would say that 1945 was the start of the golden age. Many of us returning from WW II service rushed to buy model aviation magazines such as *Model Airplane News* and *Air Trails* with info provided by the likes of E.J. Lorenz, James Custin, Claude McCullough and George Trammell. That was when we wound our own RF choke coils and were introduced to escapements by building them ourselves.

"I remember going to the radio-parts supplier to buy a 8,000- to 10,000-ohm coil for $1; it was then attached to a hand-crafted mechanism to create a relay to operate an escapement. After assembling the additional parts, I had a receiver that could be mounted on the latest R/C model—the Electra (of course!). The plans for this plane covered about one quarter of a *Model Airplane News* page and included a three-view with cutaways that showed the internal structure. Remember, there were no full-size-plans services back then! Within a month, I completed the drawings of this 8-foot-span design, and I began construction.

"The transmitter was just as much fun to put together as the receiver, with only one hitch: it transmitted on 50 to 54MHz—an amateur radio band for which an FCC license is required. It was difficult to understand how one could be an accomplished RC'er and yet be required to transmit 13 words per minute of Morse code to obtain a license, especially because the code has no relevance to R/C.

"A new phase of R/C began in April of 1948, when Ed Lorenz announced in *Model Airplane News* that two frequencies had been approved by the FCC for experimental work by radio manufacturers. The objective was to develop R/C systems for use on 27.255 and 465MHz with a limited input to the final stages of 5 watts and 10 watts, respectively.

"R/C'ers who bought this first approved equipment qualify for the distinction of belonging to the golden age. Both Bill Winter and E.R. Foxworthy had prototype sets supplied by Vernon McNabb, who received FCC approval for the 465MHz band in 1950. Bill tested his radio in his Citizen design.



Not all early R/Cs were cabin-style and Live Wires! Anyone recognize the proud owner of this rudder-only design at an early Nats?

Foxworthy tested his in his twin-rudder Hoosier Hot Shot, and he later won the Nats with the same setup. McNabb's Citizen Ship Radio Corp. later offered a 27.255MHz system called the Citizen Ship 27, which was very successful. *[Author's note: Bill did not relate how 27.255MHz equipment got started. The already existing 50MHz Aerotrol system was quickly offered on 27.255MHz. Also, John Worth did some Aerotrol evaluation flying with his Cement Mixer model—à la Winter and Foxworthy perhaps? Anyone have more to add?]*

"The transmitters required FCC approval, but experimentation with everything else continued, including receivers, pulse coders, escapements, electric motors, engine control and control surfaces such as the "rudevator" and Rhodes spoon-type gadgets.

"Even the planes did not escape experimentation. Details such as engine location, wing position, landing-gear arrangement, control-surface area and shape, airfoils, etc., were all investigated. Nothing had yet been standardized. Hal deBolt was the first to offer R/C model kits that kept pace with the advances in R/C. The first true R/C kit was the Live Wire trainer.

"The golden age came to an end with the introduction of the FCC-approved multi-proportional systems that are still used today. After a short development period, they were fairly reliable, and all your requirements could be found on the hobby shop shelf—no more need to homebuild and experiment; R/C modelers could finally spend shop time on their dream craft and develop their pilot skills. R/C had really arrived!"

One thing is for sure, the golden age was a period of outstanding personal achievement by many dedicated modelers to whom we all owe much! So, that's how it was from another perspective; I hope you enjoyed it and appreciated Bill Broadley's tale.

MISTAKEN IDENTITY

There comes a time to make amends. In the October '94 issue, I told a bit about early activity in the Nashville area in the early '50s, and I included a photo that I had found in my archives. Understand that many of these 30- to 40-year-old photos are as unfamiliar to me as they may be to you; often, to identify them, I must rely on faded notations on the back, and they can be hard to decipher. The name scribbled on this one appeared to be Carl Gilles.

A nice letter from Carl Miller of Rio Rancho, NM, informed me that he—not Gilles—was in that photo. Sorry, Carl, but as you say, it is hard to always get everything right! Carl was very active in '50s Nashville, not only as an accomplished modeler/flier, but also as a contest director for many of the local club meets.

He migrated to California where, in Ventura, he ran a hobby shop for more than 40 years until he retired to New Mexico. His shop is said to have been one of the best.

It's also interesting to note that this pioneer modeler is a well-decorated WW II Asian theater veteran. He was honored with five Bronze Stars, a Silver Arrow, an Asiatic-Pacific medal and a good conduct commendation. He made four beachhead landings in New Guinea and one in the Philippines. He was as busy a soldier as he is a modeler. Carl, my hat is off to you.

AERO GUIDANCE SOCIETY—FUN AND FELLOWSHIP

When we OT'ers first envisioned the Vintage R/C Society, we looked forward to get-together flying meets, à la modern fun-flys. The VR/CS provides some very interesting activities, and their outstanding Selinsgrove Reenactments have been enjoyed by many.

Left: Bob Noll and Terry Terrenoire with a radio display depicting the '30s, '60s and '90s. Right: Kurt Rose came all the way from Willouhby Hills, OH, to win with his Live Wire Cruiser.

OT'er Bob Noll and a pioneer R/C club—the Aero Guidance Society of Endicott, NY—set another example of success with their "Fun and Fellowship" event, which is said to mirror Selinsgrove! Pilots can either fly at leisure or compete. This year, "Mr. Selinsgrove" himself, Bob Bingaman, demonstrated a gorgeous replica big Schneider "Cub," and an unusual entry was Dave Mathewson's little-known OT "Miss Behaving," which his *father* built and flew extensively with young Dave's help. Dave resurrected the Miss Behaving and took it to this meet with *his* son as a helper. The best was when his son brought everyone's attention to the plaque that his Dad won with the model!—a chip off the old block?

Kurt Rose came from Ohio to win Class II with his immaculate Live Wire Cruiser, and Colin McKinley made another long trip from North Carolina with his stable of electric-powered Live Wires.

The VR/CS has established a "Spirit of Selinsgrove" award for those who have done something truly significant toward advancing OT/RC. Bob Noll very deservedly received this year's award.

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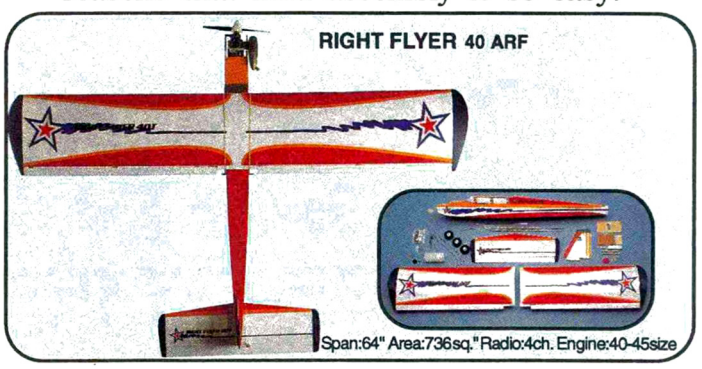


Aviation history on a grand scale

A DYED-IN-THE-WOOL aviation enthusiast would not need an excuse to take in a WW II warbird air show, and if you haven't treated yourself to such an experience, you've missed something grand. For scale modelers, a Confederate Air Force air show is a rare opportunity to see their favorite warbirds up close. They can see how a P-51D Mustang sets up for a landing, witness a B-17 Flying Fortress flyby on a bombing run and even be startled by a Pearl-Harbor-type attack of Japanese Zeros, Kates and Vals. Documentation for the serious scale modeler is only a camera lens away! No amount of black and white documentary film footage from the Discovery Channel's "Wings" television show can prepare you for the emotion of seeing the Confederate Air Force's flying history pieces put on their show. The CAF does not glorify war but, instead, reminds us of the heroic sacrifices of those who were there to protect democracy and freedom.

A special treat: the U.S. Air Force Thunderbirds put on a breathtaking flight demo that showed the full capabilities of the F-16 Fighting Falcon.

THE GHOST SQUADRON

The Confederate Air Force dates back to 1951 when Lloyd Nolen—a former Army Air Corps flight trainer—purchased a surplus P-40 Warhawk. Six years later, Lloyd and four of his friends bought a P-51 Mustang for $2,500. With this Mustang, the five pilots became known as the Confederate Air Force. The story goes that, one day, on arriving at the Mercedes airfield in south Texas, the group discovered that a prankster had painted a sign on their Mustang. It read "Confederate Air Force," and the name stuck.

This is not a Japanese Zero but, rather, a highly modified AT-6 Texan. The CAF does have one authentic flying Zero; the rest of the CAF's "Imperial Japanese" show planes are pseudo-samurais.

The B-17 "Sentimental Journey" was like a flying mirror of polished aluminum. Notice the two movie-camera "Bombing Mission" stencils denoting movies the great bomber flew in.

The unique shape of the Heinkel He-111 German bomber streaks by in a low camera pass. Goose-bump city!

A perfect study in P-51 takeoff attitude. Nervous Energy V—a two-place D version—flew numerous sorties at the Wings of Freedom Air Show. What a great paint scheme for your next Mustang project.

What would an air show be without the AT-6 Texan? A number o these advanced trainers are present at most warbird shows, and seeing them fly overhead in tight formations is a treat.

by GERRY YARRISH

Confederate Air Force

Left: the yellow-tailed B-17 Fuddy Duddy on its way to a three-bomber flyby. The Flying Fortresses were a very popular part of the air show, and tours were available for those who wanted to see the inside—bombs and all.

The Yankee Warrior takes off for another sortie while ground troops observe.

A rare bird indeed, this Curtiss Helldiver is the only flying example in the world. Here it sits with wings folded as if it were on the deck of a carrier.

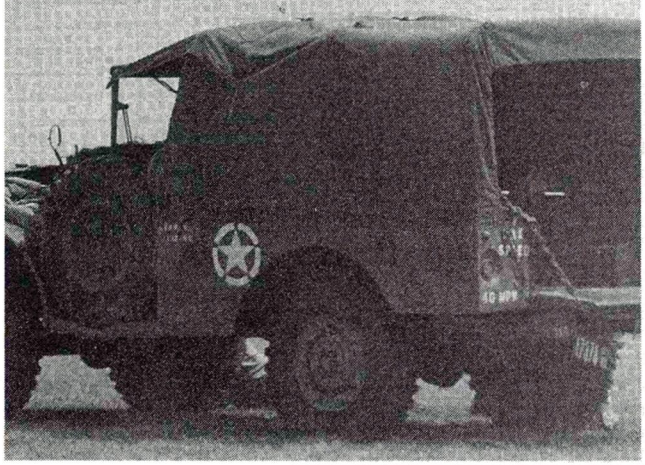
A P-47D Thunderbolt from the Kalamazoo Aviation History Museum also took part in the CAF Wings of Freedom Air Show in Frederick, MD. Here, the Jug sits on the taxiway waiting to take off.

HOME OF THE Ghost Squadron

The fleet of World War II warbirds that the Confederate Air Force preserves and often flies is affectionately referred to as the Ghost Squadron. The Ghost Squadron is stationed at the CAF American Airpower Heritage Museum in Midland, TX, which is located on the 85-acre CAF headquarters complex. The AAHM is internationally known for its collection of WW II artifacts and memorabilia, including uniforms, weapons, photographs, aircraft and equipment. The approximately 14 to 20 display aircraft are changed quarterly so there's always something new to see.

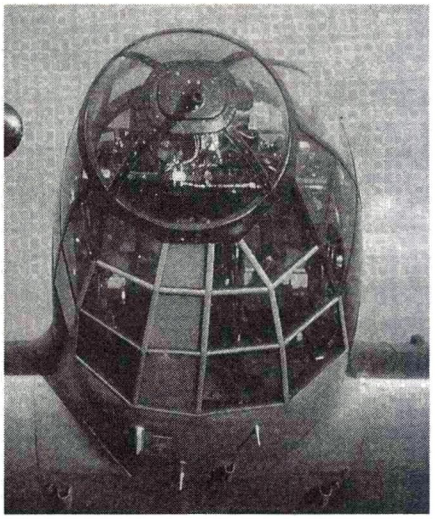
The world's largest flying museum with its fleet of 135 planes includes WW II aircraft flown by the U.S. Army, the Air Force, the Navy, the Marines and the Coast Guard, the British RAF, the German Luftwaffe, the Imperial Japanese Navy and the Soviet Air Force.

For more information, contact the Confederate Air Force, American Airpower Heritage Museum, 9600 Wright Drive, P.O. Box 62000, Midland, TX 79711-2000; phone (915) 563-1000.

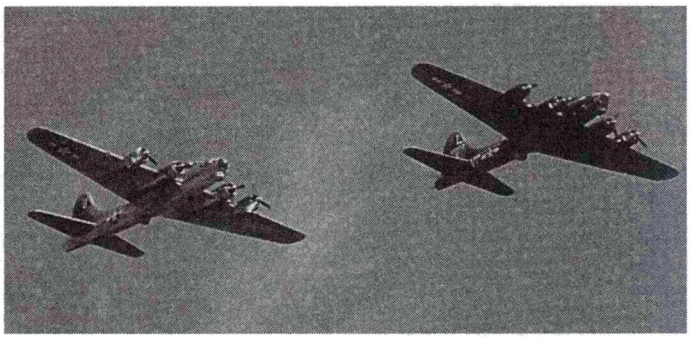


CONFEDERATE AIR FORCE

In 1958, the group bought two Grumman F8F Bearcats for $805 each; the CAF was growing. In 1960, the CAF began a serious search for WW II aircraft, but they soon discovered that very few were left in flying condition. The group was shocked to find out that neither the USAF nor the U.S. Navy were making any efforts to preserve these wonderful aircraft. The fact was that these aircraft were rapidly and systematically being destroyed—a loss to future generations that the CAF couldn't tolerate.



Notice that the nose-glass geometry of the Heinkel He-111 is asymmetrical. Where's the Windex?

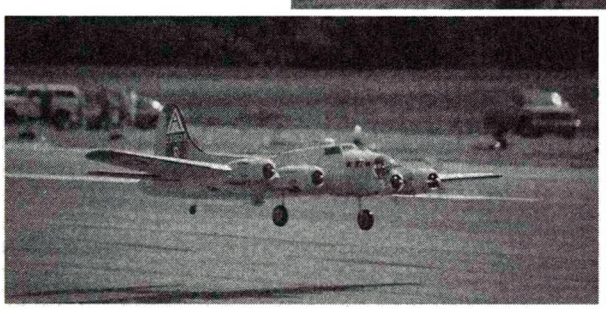


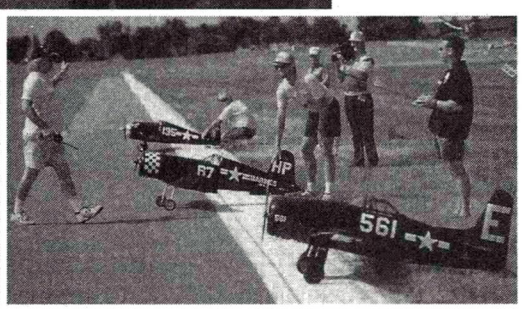
Part of the B-17 flyby. The sound of those big radial engines is not soon forgotten.

By September 6, 1961, the CAF had become a chartered, nonprofit Texas corporation with nine aircraft in its fleet. In 1965, the CAF's first museum was completed at Old Rebel Field, Mercedes, TX. The 26,000-square-foot building became home to the Ghost Squadron. The new museum (see sidebar) includes medium and heavy bombers, such as the B-25, B-26, B-17 and B-24.

Today, the CAF is an all-volunteer organization comprising some 7,500 members, several hundred of which serve as pilots and flight and maintenance crew members who are dedicated to the preservation of WW II American aviation heritage. At present, the CAF's fleet of rare and classic warbirds stands at 135 aircraft, all of which will be preserved for generations of aviation enthusiasts to come.

The CAF's Wings of Freedom Air Show attracted many thousands of spectators. Here, some war-weary German troops take a break from their Blitzkrieg to enjoy the event. Actually, they were part of the air show's reenactment staff.





Giant-scale model warbirds from Delaware, New York and Maryland were also on hand at the Wings fo Freedom Air Show. The models flew on the same air strip as the full-size war machines.

MODEL AIRPLANE NEWS
CONSTRUCTION

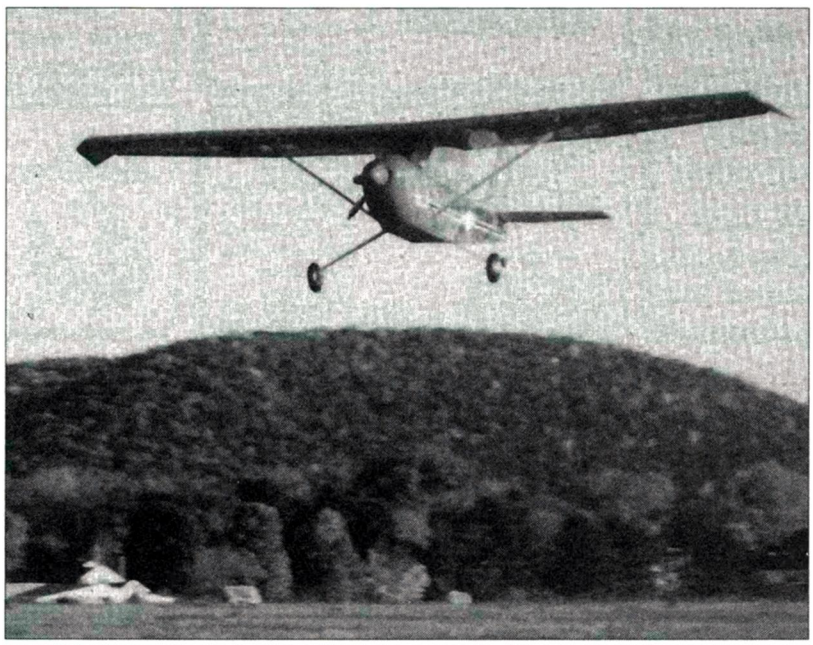
McCessna

A versatile, sorta-scale sport flier

by ERNIE HEYWORTH

ONE OF THE questions I'm asked most often is where I get my ideas for new plane designs. I wanted to build an easy-to-see, slow-flying, soft-stalling plane with versatile construction that would fit various fliers' tastes. McCessna is a "transformer" that can be made in different configurations: you can add ailerons to the standard wing, change from tail-dragger to nose gear and convert from electric to glow power. The guys at the field also wanted a craft that looks like a full-scale plane (J-3, Porterfield, or Cessna). My flying buddies are my most critical judges, and they tell me without hesitation whether something is good or bad.

The main inspiration for the McCessna came from Claude McCullough's Sr. Kadet, which is sold in kit form by Sig Mfg.* Because it's such a great performer, the Sr. Kadet is my favorite plane for teaching beginners and flying for relaxation. After much trial-and-error engineering—and six McCessnas, each with additional changes—I achieved the plans you see here.



START BUILDING

I'm not providing stick-by-stick instructions because I feel that highlighting the critical mistakes I made is more important. If you get stuck, just ask your flying buddies for construction advice—it's free and probably plentiful. If you're isolated, or if you're tired of their chuckling at what they call "dumb questions" (you know, the ones they can't answer), try two books from Air Age Publishing—"Scratch Building R/C Airplanes" and "R/C Airplane Building Techniques"—and read *Model Airplane News* (see Pilots' Mart).

• **Fuselage.** Don't be afraid of the tapered fuselage. Use the two center formers to form the sides, then put in the firewall and pinch off the tail section. Make sure you build left and right sides by placing the lite-ply on the correct side of the sticks. Otherwise, you'll be well on your way to building two planes. Use epoxy on the parts ahead of the center of gravity (CG), and use white glue or Hot Stuff* at the rear. Landing gear is available from Sig (part no. RP-BA-265). To keep the weight down, consider a wire gear, such as that on the Sr. Kadet.

My McCessna has blind nuts (T-nuts) in the firewall for either a radial-mount glow or electric power. Plan so the cowl, available from Precision Fiberglass*, will fit. Again, to keep the weight down, you can use ½-inch-thick sheet-balsa cowl cheeks.

• **Wing.** This wing is conventionally built. Double the spars, and glue them together as a side assembly. Set the ribs on the spars, then set the leading- and trailing-edge stock tightly against the ribs. Because your templates may have some distortion, sand the ribs carefully. Notice the shear webbing is in between the spars—I-beam construction. The tip ribs take extra webbing to help support the "Horner tips." Join the halves on the dihedral templates. The strength of this joint comes from glass cloth over the center sheeting. If you're building the aileron wing, remember to install the fillets on the inboard sides of the aileron. Also, when you sheet the center bottom, try to come across the center with one piece of 1/16-inch-thick sheeting.

• **Tail feathers.** Attaching the tail feathers is routine. Notice the wedge-shaped platform under the stab (see the plans); it's important to get the correct angle of incidence. Add the center exterior spars after you've taken the framed parts off the print.

• **Covering.** I used a transparent covering even though full-size Cessnas are usually white with color trim. Stick construction gets its strength from the covering. Some coverings soften in the heat, so be careful to use one that stays tight.

SETUP

Balance the plane just ahead of the main spar, and use more throw than normal on your controls. At the widest point on the surfaces, use: rudder—1½ inches left or right; elevator—1½ inches up, 1

Materials

Wing

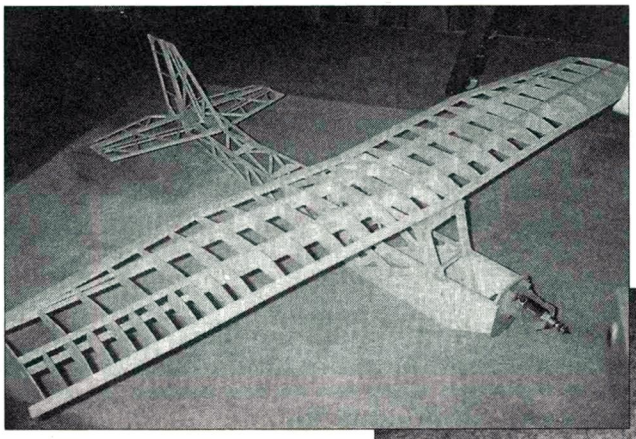
2—1/8x1 1/2x36 spruce spar
4—1/2x1/4x48 balsa spars, hard
4—3/8x3/16x48 balsa spars, hard
2—3/8x1 1/2x48 trailing-edge stock, medium
5—1/16x4x36 sheeting, medium
2—1/2x1/2x48 leading-edge stock, medium
7—3/32x4x36 ribs and webbing, medium
1—5/16x4x36 tips cabin top and fillets, etc.

Fuse

2—1/8x12x48 lite-ply
2—1/4x1/4x36 spruce front sections
4—1/4x1/4x36 frame balsa, hard (front)
6—1/4x1/4x48 frame balsa, medium (rear)
1—1/4x1/2x36 cabin top, hard
1—1/4x12x12 lite-ply, firewall landing pads, etc.

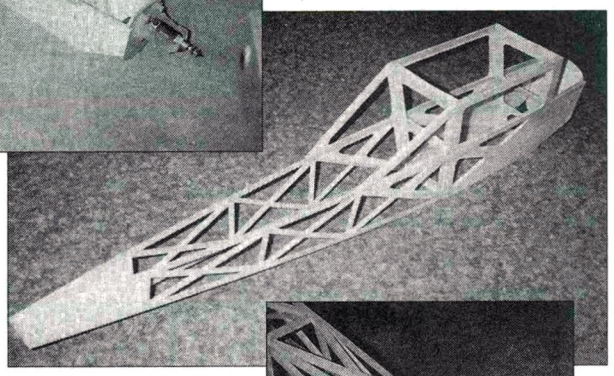
Stabs

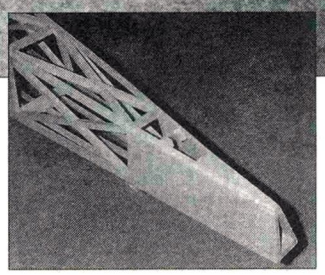
2—1x5/16x36 trailing-edge balsa, medium
6—5/16x5/16x48 framing, medium
2—3/32x3/8x48 exterior spars, medium



Left: the assembled frame with the electric motor.

Below: the completed fuselage is ready for the cross-bracing.





Right: The aft fuselage is completely assembled and sanded to shape.

inch down; ailerons—1 inch up, 3/8 inch down. Once you're comfortable with flying the McCessna, take out the excessive throw that makes it react too quickly.

I flew the prototypes on an Enya* .46FS, a Saito* .80 FS and an Astro* 40 electric-geared motor with 18, 1200mAh cells. The Enya was ideal spinning an 11x7 prop. The Saito flew with a 13x6 prop, and it climbed with authority. The electric-geared 40 used a new, 13x10 electric Master Airscrew* prop. When you fly the electric version, don't jerk it into the air prematurely. It can easily do five touch-and-go's.

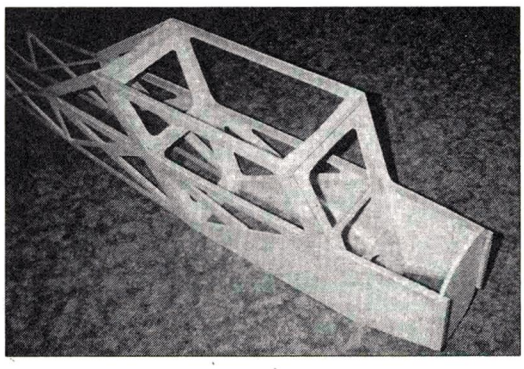
FLYING THE DIFFERENT VERSIONS

I will break down each of the configurations that I flew and try to give you the good and bad habits. There were no surprises in the McCessna. With the wide-set landing gear and long tail moment, takeoffs were steady and gentle. Landings were slow and easy because of the wingtips and the overall slow stalling speed of 12mph.

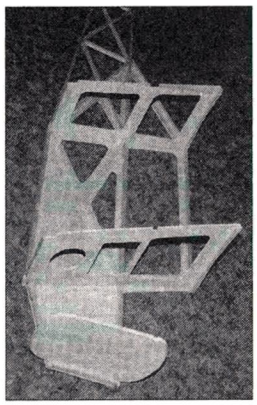
• **The Saito .80** version, with the nose wheel and ailerons, was quick to climb, and it looped and rolled easily and flew inverted with very little down-elevator. You really shouldn't couple aileron and rudder with this version. Until I learned to land on the mains, the nose took the punishment during landing.

• **The Enya .46** flew gently and sedately. I used the 10-degree-dihedral wing with rudder-only turns. I noticed a touch of Dutch roll, but this setup wants to center like a trainer. The Enya .46 was old, but it didn't have any trouble providing enough power. I used the tail-dragger version, and takeoffs were gentle without my having to add much right rudder. Landings were easier for me with the tail-dragger setup because I tend to apply back pressure on the controls for my approaches.

• **Astro 40.** Until I found the Master Airscrew electric props, the electric Astro 40 geared on 18 cells was marginal. At first, I had difficulty flying against the headwind. I flew with coupled rudder and ailerons, and that gave me better control. The first plane to fly electric was heavy—12 1/2 pounds on the 1,200 square inches. It was not fun yet! The second, 10-pound version flew much better. Remember, 3 pounds of batteries are included in those weights. Each flight lasted 4 minutes. The motor run is 5 1/2 minutes, but you should leave a little battery power to return



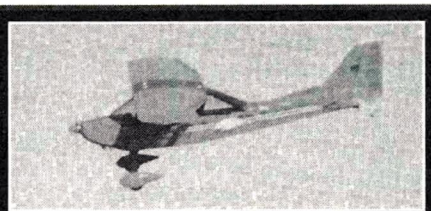
The fuselage construction is the typical two-stick sides with doublers and formers.



One half of the fuselage with formers and firewall.

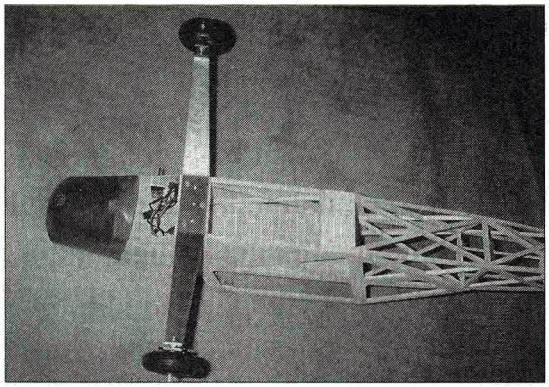
SPECIFICATIONS

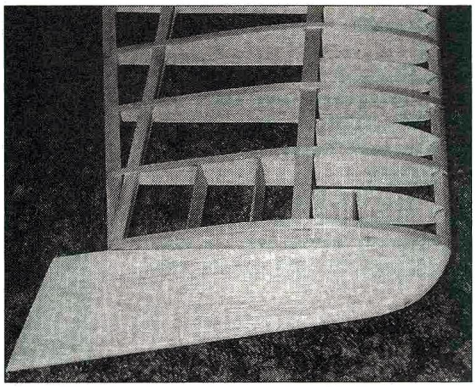
Type: sport trainer (glow and electric)
Wingspan: 83 in.
Length: 50 in.
Weight: 160 oz.
Wing area: 120 in.
Wing loading: 19 oz./sq. ft.



Power req'd: electric 40 geared, Enya .46, or Saito .80
Radio used: Ace* MicroPro 8000
No. of channels req'd: 4 (throttle, rudder, elevator, aileron—optional)
Options: aileron or stock wing; nose gear or tail dragger; electric or glow power.

A well-designed plane should offer the builder a choice of flying styles. It should also look good instead of being an ugly box with no cowl and square wings.

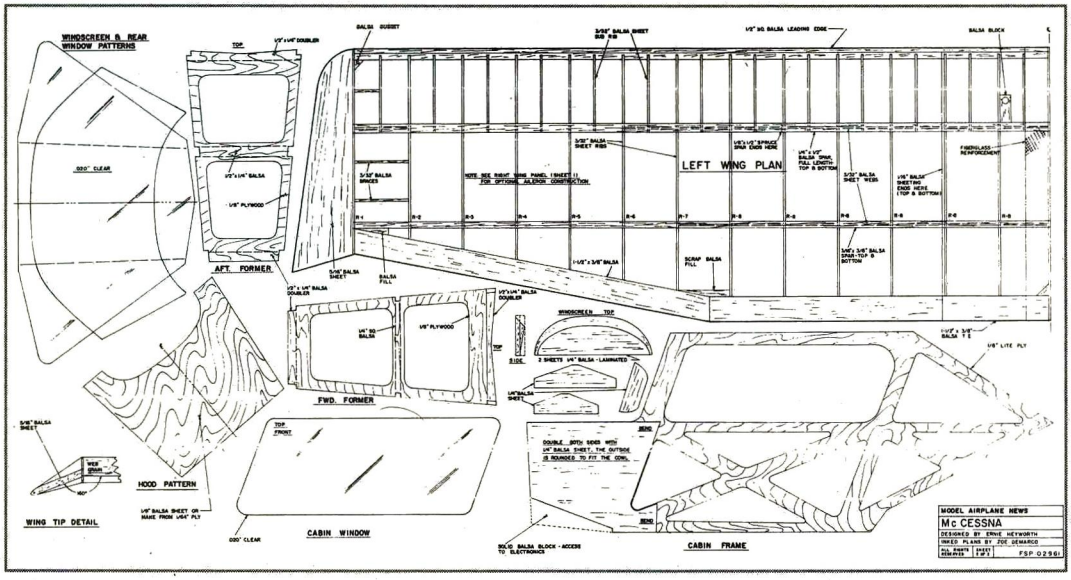


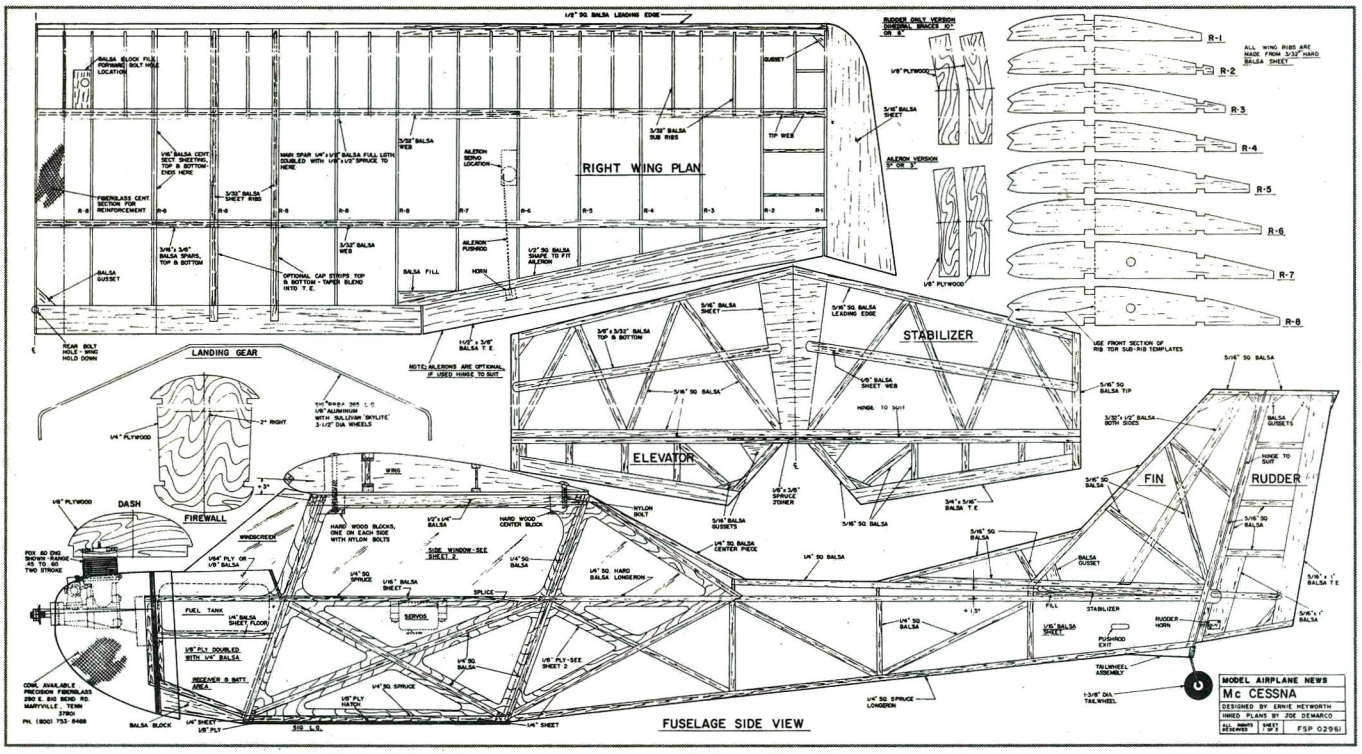


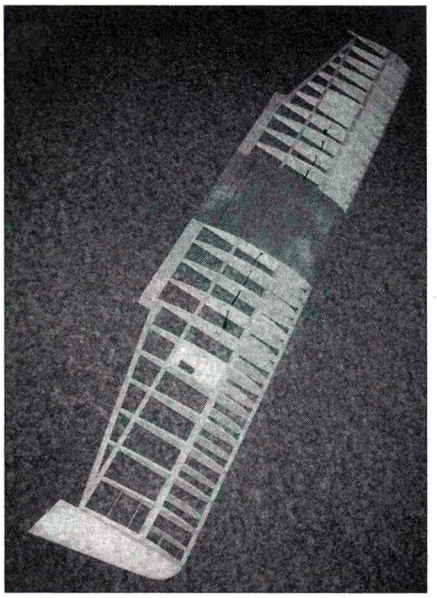
Left: the tail-dragger version with the cowl mounted. The landing gear is at the rear of the battery area. Right: details of wingtip construction.

safely to the field. The electric versions will do any of the aerobatics that the Enya .46 version will do, i.e., rolls, loops and touch-and-go's. This surprised my "power" friends because they think of electrics as sailplanes with assistance.

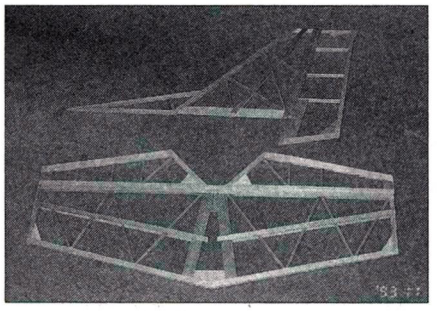
Set the McCessna's trim to the power you use. The Saito .80 requires down-trim when flying flat out. The Enya .46 flew with the trim centered and with the throttle fast or slow. The stall characteristics were what you'd want for a trainer. Full back-stick at low throttle produces a straight-ahead mush. The dead-stick characteristics of this plane are comparable to a large sailplane with wheels. Don't pull full up-elevator, or the McCessna will just mush down slowly. Instead,







Aileron-version wing. Servo extension wires are routed through the wing ribs.



To make the horizontal stab stronger, as you build it, be sure to fill in the center core with a thick sheet of balsa.

push the stick forward, and maintain your flying speed until you are over the threshold, then ease back on the stick to set it down.

CONCLUSION

A well-designed plane should offer the builder a choice of flying styles. It should also look good instead of being an ugly box with no cowl and square wings.

If you're looking for a big, slow-flying, easy-to-control plane, the McCessna is for you. If you want to carry a 3-pound video camera or some bombs, this plane can do it. If you want to easily switch between electric and glow, this is your plane. If you want to have a rudder-only trainer with a standard wing and later add a wing with ailerons, start building the McCessna today.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

ORDER THE FULL-SIZE PLANS...SEE PILOTS' MART

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

HOBBY LOBBY Jr. Telemaster

Pre-fab classic trainer

by JOHN WARD

THE BASIC TELEMASTER design has been available as a plans set and a kit in a variety of sizes for more than 20 years. The stories of things that people have done with this plane could fill a book. The .40-size trainers frequently outperform other high-wing trainers, which they closely resemble. Currently, Hobby Lobby Intl.* offers six versions of the plane, in kit and assembled forms, with wingspans of between 54 inches and 12 feet. The 54-inch Deluxe Jr. Telemaster—the baby of the family—is the subject of this review.

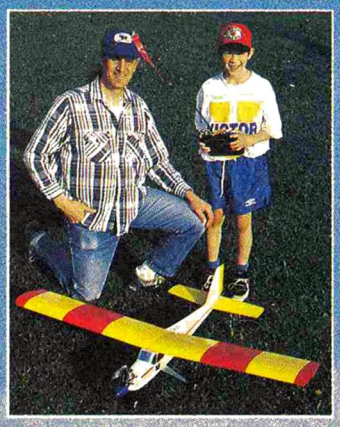
HIGH QUALITY

The packing is well-thought-out, and it protects the parts against moisture, vibration and impact. The pristine, beautifully finished parts inspired me to start building.

In a world of abbreviations such as ARF, RTF and ARC, Hobby Lobby has coined yet another: THTF—10 hours to fly. It's true; you really can build one of these little guys in 10 hours or less.

The building process is more like assembly than construction. No plans are provided, or needed, for that matter. The wing halves have been joined, sheeted and sanded, the center joint has been wrapped with glass cloth, and the dowel and bolt holes have been drilled. The ailerons have been fitted and hinged, and the tail surfaces have been shaped and sanded. To minimize warping, the stab has cross-grain endcaps. The installed firewall has been drilled for fuel lines, and T-nuts have been installed for the included aluminum engine mount and epoxy-coated to fuelproof the firewall. Pushrods have been installed, and T-nuts have been installed for the main gear and wing mounting. A trial fitting showed that all the parts and holes lined up perfectly. No exaggeration, this is a well-designed, well-made, high-class kit.

On the landing approach, the Jr. Telemaster is docile. Drop the throttle, feed in a little up-trim, and flare just before touchdown—a textbook landing.



The teacher and the student proudly pose behind their great trainer plane. The Telemaster series is one of the best for training.

CONSTRUCTION

For the most part, the instructions are thorough and very detailed. The suggested assembly sequence is good, but there are a few loose ends. If you've built and flown a couple of models, you'll have no problems, but beginners will need a little help. The only illustration is the picture on the outside of the box, so it's worthwhile to read the instructions a few times to become familiar with the parts and procedures.

Epoxy is recommended for most of the assembly. Hinges are installed with epoxy or CA. Building begins with covering the wing and the ailerons. Any low-temperature covering material is OK; I used Oracover* Cub Yellow with red trim. Everything looks good up to step 10: "Install your aileron servo into the wing." No mounting rails are provided, but it's no big deal; the scrap box supplied a few bits of balsa and 1/8-inch-thick ply, which I epoxied into place.

• **Tail feathers**. The only "work" required here is to cut the hinge slots. The horizontal stab is epoxied into a precut slot in the fuselage. Before I attached the rudder, I smeared some epoxy on the rear of the fin to fuelproof the exposed balsa. I also pinned all the hinges.

• **Landing gear**. This goes together nicely. Apply a thread-locking compound, such as Loctite* 242, to the main gear axle threads. This will prevent things from coming loose, but the nuts can still be removed if you want to change wheels. The kit's wheels are made by Kavan. They're attractive, feather-light, about 2¼ inches in diameter and of excellent quality, but on my club's grass strip, small wheels tend to take root; I substituted 3-inch Dave Brown* wheels—my only change to this model.

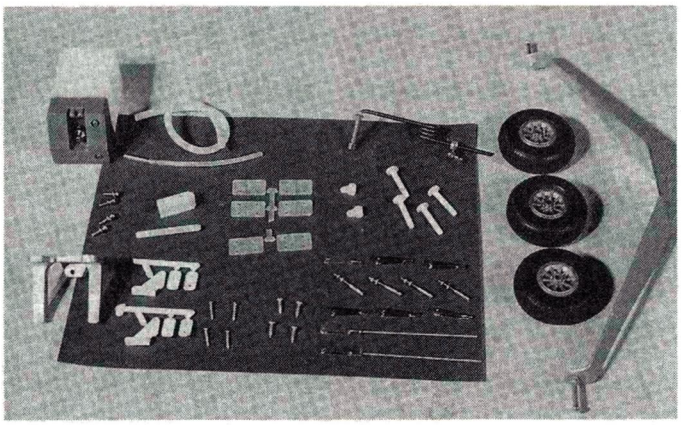
SPECIFICATIONS

Model name: Deluxe Jr. Telemaster
Type: sport/trainer
Manufacturer: Hobby Lobby Intl.
Wingspan: 54 in.
Wing area: 420 sq. in.
Airfoil: flat-bottom
Weight: 53 oz.
Wing loading: 18 oz./sq. ft.
Length: 37 in.
No. of channels req'd: 4
Radio used: Futaba FM, DAD receiver, DAD servos
Engine req'd: .15 to .25 2-stroke
Engine used: Fox .25
Prop used: Master Airscrew* 9x6
List price: $199.95

Features: obechi-sheeted foam; epoxy glass fuselage; balsa control surfaces.

Hits
- High-quality materials.
- Fit and finish of components.
- Completeness of kit.
- Flight characteristics.

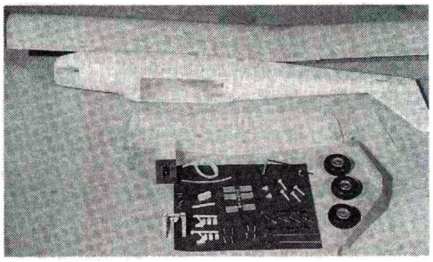
Misses
- Instructions are sketchy in places.
- No illustrations.



The kit includes a complete, high-quality hardware package.

• **Engine installation**. The engine mount was custom-made for the kit and accommodates engine crankcases of up to 29mm or 1⅛ inches wide. Dave Abbe of DAD Corp. Inc.*, graciously lent me a Fox* .25, which fits the mount like a glove. I have flown my "test bed" model quite a bit with an old cross-scavenged Enya* .19 TV, which is adequate, but not spectacular. I suspect that most current Schnuerle-ported .15s should be up to the task. Most .15 to .25-size engines should fit, but check the crankcase dimensions before you buy.

• **Radio and pushrods**. A plywood plate is provided for the servos. You'll need to cut appropriate holes in it to accommodate the servos you choose. I used DAD Pros, which are of standard size, but micro-servos are fine in a plane of this size and will save some weight. Clevises are supplied for pushrod hookup, but the instructions suggest that you can use another method. I don't like struggling with clevises in a cramped fuselage, so I used Great Planes'* screw-lock pushrod connectors,



The contents are laid out for a parts check. From start to finish, it should take roughly 10 hours to complete the plane.

TRAINING ON A BUDDY BOX

Getting started in R/C requires a substantial investment of time and money. With a club-owned plane, it's possible to give flying lessons to newcomers so they can "try their wings" before taking the plunge and to teach youngsters who cannot afford their own equipment. My flying club—the Genessee Valley Aero Modelers—has always encouraged new modelers and would-be pilots, especially youngsters, so I decided to donate the Jr. Telemaster to the club.

FREE RECEIVER AND SERVOS

Dave Abbe of DAD Corp. shares my feelings; DAD has a co-op dealer program whereby they will donate a receiver and standard servos to any club that is building a club trainer and is qualified by a local DAD dealer. *[Editor's note: if your club would like to participate in this program, please contact a local hobby shop or DAD dealer.]*

My first student was 9-year-old Bill Wesson. He proved to be an eager and capable pupil.

Young Bill Wesson concentrates during his flying lesson. He is doing very well and will soon solo.

Working with a buddy box is easy, but it takes some getting used to. Proper setup is essential. First, fly the plane and trim it properly. Next, plug the two transmitters together and, while the model is on the ground, hold the trainer switch on the main transmitter. See whether the slave sticks move the controls in the right way. If not, adjust the reversal switches until they do. Then check the slave trims by throwing the trainer switch on and off several times and observing the control surfaces. They may jump a bit as the switch is thrown, but for both switch settings, they should become neutral at the same position. Do this carefully, or your student will be struggling with an out-of-trim plane. If possible, test-fly the system with another experienced pilot to double-check the trims.

When you fly, try to train yourself to follow the student's moves, i.e., fly the plane along with him. If you find that your thumbs strongly disagree with his, let go of the switch. This minimizes the "Omigosh" factor if you need to take control in a hurry, because you're already flying the plane. To become comfortable with the system, do what you do with any new aspect of flying: practice, practice, practice.

because they can easily be adjusted from above. Having made that choice, I had to add about an inch to the nose-wheel pushrod, but all the others were extra long and hooked right up. The pushrods are made of multi-strand cable, so I tinned the ends with solder to give the setscrews a good grip.

The pushrod housings must be anchored at their inboard ends, near the servos. The instructions make no mention of this, nor are any materials provided with which to do it. The pushrods are so flexible that without internal support, they are helpless; not even the throttle cable will work. I made some supports of scrap ¼-inch balsa and epoxied them into place. The control throws were set up according to the instructions: ¾ inch each side for the rudder and ½ inch each way for ailerons and elevator.

• **Tank installation**. The fuel tank has two open vent holes in it; I capped one of them and ran my pressure line to the other. There's a shelf for the tank already installed in the fuselage, so I just threaded the lines out through the pre-drilled holes in the firewall and then wedged the tank into place with some foam. Some silicone glue around the firewall holes finished the job.

• **Balancing**. All that remains is to install the receiver, switch harness and battery and to balance the model. With the 600mAh pack nestled under the fuel-tank shelf and the foam-wrapped receiver in the convenient hollow in front of the servo tray, my plane balanced 2½ inches back from the leading edge. The radio system selected is a Futaba/DAD combination (see "Training on a Buddy Box" sidebar).

I built two Jr. Telemasters and have had a ball flying both of them. The review plane has about 25 flights on it, and it's good as new; the only "problem" I encountered was loose engine-mounting screws, but I've now "Loctited" them into place. My "test bed" model has been beaten up a bit but it works perfectly, and that attests to the ruggedness of the model. On a hard landing, the nylon landing-gear bolts will break away to prevent the fuse and gear from being damaged. Recently the "test bed" suffered a straight-in crash that tore everything loose inside the plane and broke the engine mount, but it's repairable. In other words, it's pretty tough!

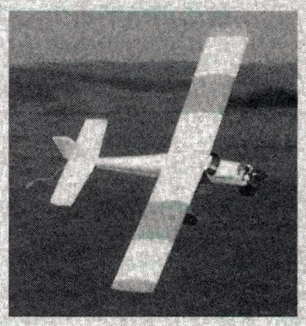
I recommend this kit to everyone. Again, a first-time builder will need a little help to overcome the "gray areas" in the instructions, but this is true of most kits. The Jr. Telemaster is an attractive, first-rate model that flies well and looks great.

** Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

FLIGHT PERFORMANCE

• Takeoff and landing

With the controls set at the recommended throws and the nose wheel carefully aligned, the Jr. Telemaster tracked arrow straight down the runway. After a ground roll of about 75 feet, it gained speed, and a little up-elevator had it flying. I watched, hands-off, as it rapidly climbed to about 200 feet. The plane flies and responds so smoothly that it took a couple of laps to determine whether it needed trimming! Finally, I decided to add two clicks of down-trim. Landings proved equally pleasant; the model has a very flat, stable glide. It can land fast on all three wheels, or very slowly, with its nose wheel high in the air. It handles nicely on the ground and, for a high-wing trike gear model, it's fairly indifferent to crosswinds.



• High-speed performance

At full throttle, the plane assumes a new persona. Like any flat-bottom-wing model, it tends to climb with air speed, but it never becomes twitchy; it always flies smooth as glass.

• Low-speed performance

Next, I slowed the engine to idle and gradually added full up-elevator. The plane never stalled, but mushed along straight ahead, slowly losing altitude. I forced it into a stall, and it finally quit flying, dropped its nose and started to fly again. Dead-stick tests yielded the same results. The model maintains altitude at ¼ throttle and flies very slowly for its 18-ounce wing loading. Turns are best accomplished by adding a little rudder, but the plane can be flown with either rudder or ailerons alone; in fact, by adding some up-elevator trim, it can be flown easily with just rudder and throttle.

• Aerobatics

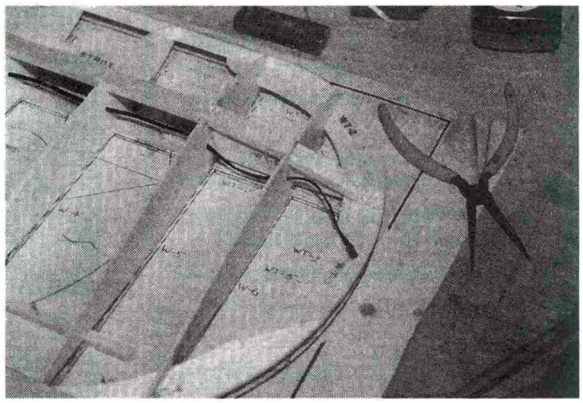
With the Fox .25, there's plenty of power to pull great big loops. Rolls are surprisingly straight and crisp. Cuban-8s, square loops and inverted flight are no problem. It will pull an outside loop from level, inverted flight. The plane won't snap, but it can be coaxed into an inverted spin. The rudder doesn't have quite enough authority for knife-edges, but it has enough to do beautiful sideslips, which make crosswind landings fun. Mind you, I didn't adjust the control rates; they were set up just as the instructions recommended.

by GERRY YARRISH

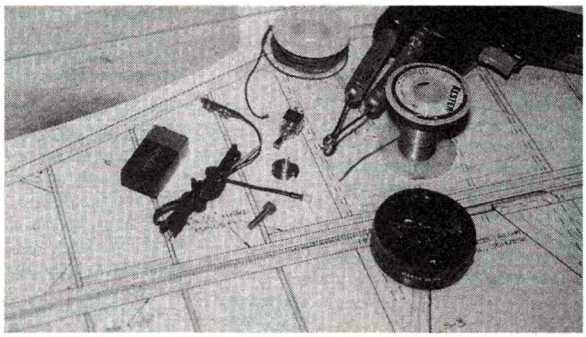
WINGTIP LIGHTS FOR BIPES

THE ONLY problem with having wingtip lights on a biplane such as a Stearman PT-17 is the wiring associated with getting electricity to the top wing. Somehow, the wires have to be hidden from view. You could put the battery pack in the top wing, but then where do you put the switch so that it doesn't infringe on the model's scale outline? I like to install switches in one of the cockpit openings so that I have a clean-looking model yet still have easy access to the radio and light switches.

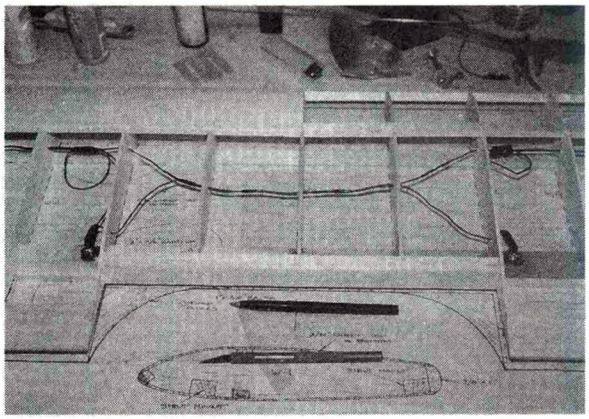
This technique is also a natural for other biplane designs, such as the Great Lakes trainer (FSP08742), the Bucker Jungmeister (FSP05901) and the Der Jaeger (FSP02862). Here's how I solved my wiring problem.



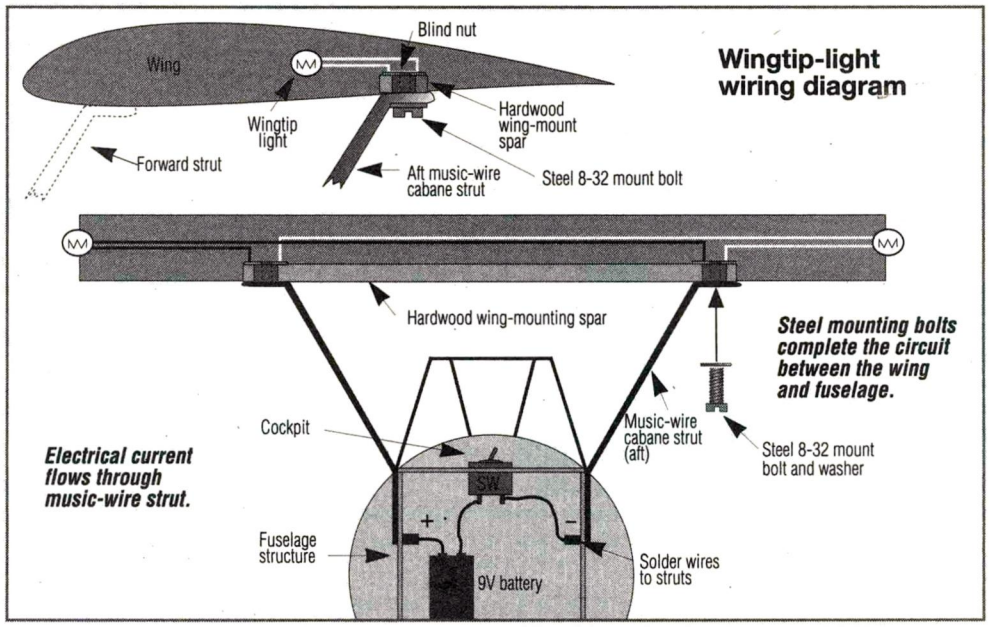
2 ***During construction, drill holes in the wing ribs and install the lights and wire leads. Be sure that the wires are long enough to allow you to adjust the positions of the lights after the wing has been covered. You'll drill a hole through the wingtip and slip the lights out so that approximately 1 inch of wire is exposed. Then, after covering the wing, push the wires and lights back into their respective holes, and secure the lights with silicone sealant or a dab of hot glue.***

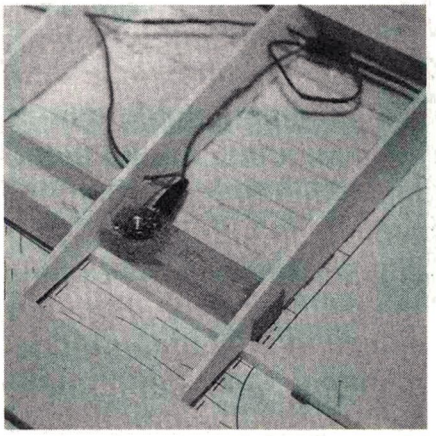


1 ***You'll need: a wiring harness from RAm Products*, a Radio Shack switch (SPST), wire, a soldering iron, solder and flux, a 9V battery, 8-32 blind nuts (one for each cabane-strut mounting bolt) and steel bolts to attach the top wing. You'll also need some shrink-tubing or electrical tape.***

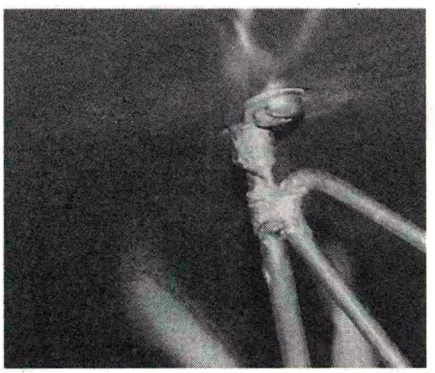


3 ***Back to the construction. Before you complete the wing center-section sheeting, arrange the wires neatly as shown, with the positive leads of each wingtip light at the left, aft, cabane-attachment blind nut and the negative leads at the right, aft blind nut. Notice that I used short pieces of shrink-tubing to bundle the wire leads neatly into place. Any excess slack in the wiring can be looped as shown. Don't tension the wires too much, or vibration could cause the solder joints to fail.***





4 ***Clean the surface of the blind nut and apply some soldering flux. Heat the blind nut with a soldering gun, and solder the wire leads into place. Now, with both positive and negative leads soldered, complete the wing's center-section sheeting and cover the wing.***



5 ***When the wing is bolted into place on top of the music-wire cabane struts with steel bolts, the wing-wiring circuit is extended into the fuselage. Electrical wires are also soldered to the bottom of the aft, music-wire cabane struts. These wires are attached to the 9V battery and the lighting system's on/off switch. The illustrations show this system in detail and should make it easier to understand.***

When the wing has been painted and balsa fairings have been added to the cabane struts, the model looks neat; no unsightly wires are visible between the top wing and the fuselage. There are no wire connections to attach, and there's no chance of a connection failing (unless the wing comes off in flight, in which case you won't be worrying about the lights anyway!). This wiring setup has a simple design, is easy to make and requires virtually no maintenance. Try it on your next biplane or parasol model, and watch your friends go nuts looking for the wires. Enjoy!

Center ON LIFT

by MIKE LACHOWSKI

TRIMMING FOR WINDY CONDITIONS

DO YOU HAVE trouble flying with wind gusts of more than 10 or 15mph? If you stall when you least expect it and have problems maintaining a thermal circle, then it's time to make some adjustments. The real culprit is the changing wind. A sudden drop in wind speed will make your wing stall—turning downwind and trying to maintain what looks like the same speed will do the same thing. Smooth flying pays in calm conditions; it helps when it's windy, too.

Before you reach for the ballast, put in a click of down-trim. Although you won't have optimum lift, you'll be moving away from the slow close-to-stall speed. When the wind speed changes, it will no longer be enough to result in a stall. This trim certainly isn't ideal for maximum hang time in calm air, but in wind, it will mean smoother flying and fewer stalls or "bobbles."

Some people like to move the CG way back to make the model more responsive to thermals. In turbulent conditions, this can be detrimental to flight performance; you don't want your model to respond to the turbulence. Adding a small nose weight will make the model less responsive

SOMETHING DIFFERENT

Before my annual trek to Cape Cod, I decided to build some new slope ships. Because I had plenty of small, 60-inch racers and hand-launch gliders, it was time for something different. I noticed some pictures of the small WW II scale gliders from Dave's Aircraft Works*, and I ordered a few. Hey, you can't fly just one; you need a few to fly formation or combat. I ordered a P-40 and a Focke-Wulf Ta-152 for less than you would pay for most 60-inch slopers.

The kits have foam-core and balsa sheeting for the wings, sheet balsa tails and balsa fuselages. Wow! I get to remember how to work with these high-tech tubular cellulose composites instead of the usual carbon fiber and Kevlar. Hardware for the control linkages is included. All you need to add is glue, some extra fiberglass (if you want stronger fuselages), covering and almost any radio equipment. Even though the models are small—31½-inch span for the P-40 and 34¾-inch span for the Ta-152—there is plenty of room for the equipment. You can also get a Me 109, a P-51 and a Ki 61.

Construction is quick. I completed the two models in a week and had time to spare to complete the conversion of the S7012 wind-tunnel test section to a flapped configuration. You can work on more than one section of the model at a time, but prep the wing sheeting first. My wings were pressed; I used epoxy to glue the sheeting to the cores. Attach the wing leading-edge strip, trailing edge and tip blocks. Tack on the ailerons, and sand the wing. Pull off the ailerons after everything has been shaped, and install the aileron linkages. Join the two wing panels with epoxy, and fiberglass-tape the joint.

While the wings are curing, build the fuselage sides. The fuse is a simple box with enough triangular stock in the corners to round it out for a scale-like appearance. For added strength, I applied a layer of 1.4-ounce fiberglass to the inside. Mark the former locations, glue the precut formers, and align the fuselage. To complete the box structure, cap the top and bottom with cross-grain balsa. Now get out the sanding block, and give the fuse a scale-like appearance. Sand the tail surfaces, join the elevators, and get ready for covering.

Film covering works just fine. The only problem is landing. These are low-wing models, and the bottoms of the wings get pretty beat up in rough landing areas. I went for a scale-like color scheme and cut some insignias out of trim sheet.

The controls don't need too much throw. Though the models don't weigh much (well under 1 pound), they do require some wind for flying. My first flights were in light wind, and it was a struggle to keep the models airborne. The P-40 was the lightest of the two, and it could stay up for a few passes along the slope. I'm still waiting for better conditions to really test the models. Small airplanes sure are interesting to fly!

SPECIFICATIONS

Model: P-40 and Ta-152
Type: WW II semi-scale slope gliders
List price: $35.95
Wingspan: P-40—31½ in.; Ta-152—34¾ in.
Wing loading: 12 to 14 ounces per square foot, or more with ballast.
Airfoil: S3021
No. of channels: 2 (aileron and elevator) with JR* 341 servos and 6-channel credit-card receiver.

Features: complete kit includes foam wing-cores, balsa and ply parts, hardware, plans and instructions. For powered flight, you can modify the kit with a Speed 400 motor. You can also use a 600mAh battery pack.

Hits
- Quick and simple construction.
- Low cost.
- Realistic looks.

Misses
- Because they're small, these models aren't very forgiving at low speed in light winds.

Dennis Phelan prepares to launch the P-40 at Duck Harbor near Wellfleet, MA. The model isn't that big, but the scale appearance adds some interest.

to the elevator, and it will have the same effect as putting in some down-trim. On some days, it might be just what you need to smooth out the model's performance.

Landing approaches also need speed. Failing to keep up your speed means you'll have a long walk to retrieve your plane, and your model might do some interesting maneuvers just before hitting the ground. Try to use one more click of trim. Now your glider should fly nicely to the landing. Hold off on the flaps. The wind speed will keep your ground speed down, and that will reduce tl amount of flap needed on landi approach. With the extra down-tri you have to watch o when applying flap Simply pulling "fu flap" will produ interesting results a a "heads up" shou Practice using th intermediate fla positions. On winc days, they will pr duce the desire lower ground spee without stopping the model in the air.

**Addresses are listed alphabetically in the Ind of Manufacturers on page 151.*

HANDY HATCH HOLD-DOWN

Everyone has his favorite way of securing a model's canopy or hatch. Small hand-launch models can present an interesting problem because you want easy access and light weight. John Hauff has a unique way to hold his hatch on his Monarch. The only thing required is a 1-inch piece of heat-shrink tubing intended for electric Ni-Cd battery packs. Slide the tubing over the fuselage and canopy near the middle, and shrink it down to a nice fit. The tubing won't slide back because of the fuselage shape. To remove the canopy for access, simply slide the tubing forward on the fuselage. Don't use clear tubing; it's too easy to lose.

MODEL AIRPLANE NEWS
HOW TO

Bicycle Winch Launch

Gain altitude with leg power

by GENE CARTWRIGHT

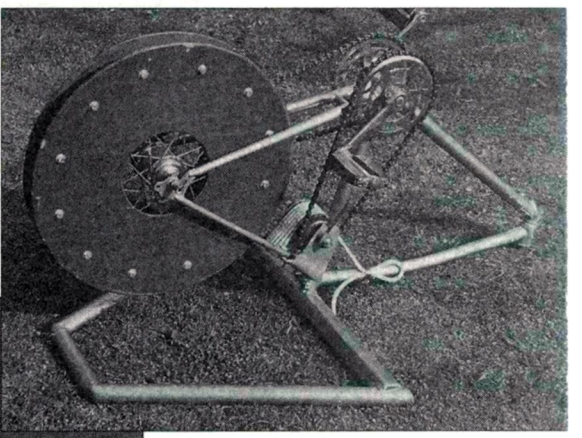
FROM down under, New Zealand, to be exact, comes a winch launcher for sailplanes that is easy to build, inexpensive and works like a dream. It's a one-man operation, so you don't have to worry about finding a flying buddy to go flying with you. Best of all, it's constructed out of readily available scrap bicycle parts plus a few extras, so the expense is minimal.

PEDAL POWER

Alan McPherson of Hawkes Bay, New Zealand, designed this unique system that launches a glider several hundred feet into the air with a dozen turns of the pedals. It has worked well with gliders that weigh up to 6½ pounds and have up to a 10-foot wingspan. Keep in mind that launch height is limited only by the length of nylon on the spool.

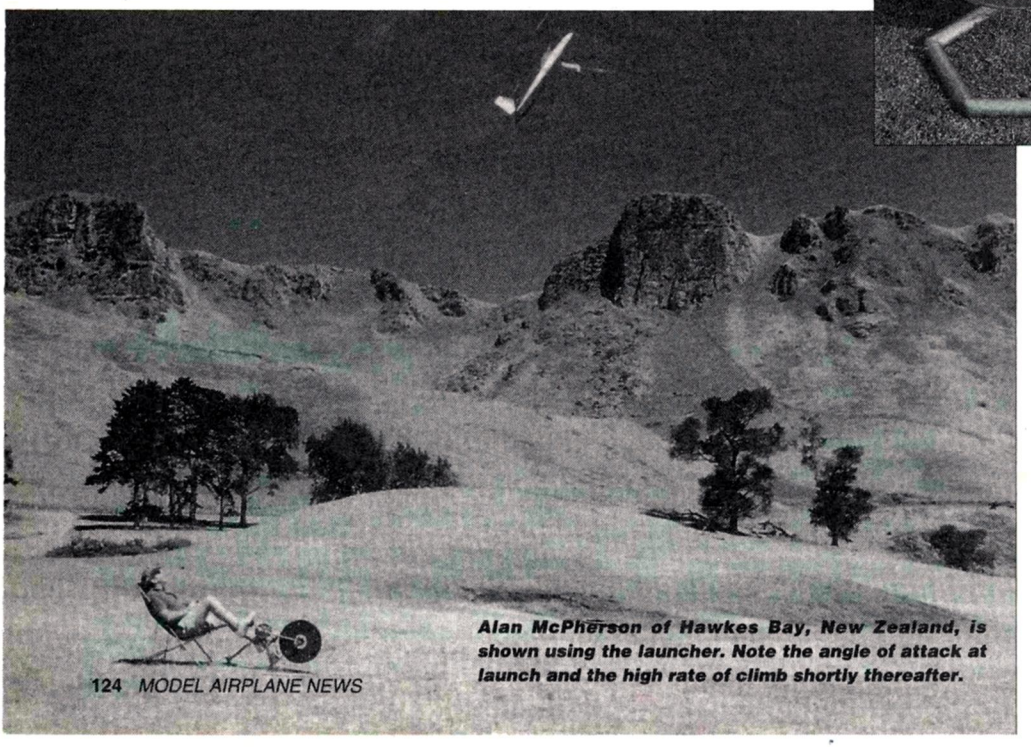
The winch consists of an old bicycle frame from which the front fork and seat have been removed; it uses only the wheel, chain and pedal assembly. A second sprocket is braised or welded onto the side of the frame parallel to the original sprocket. This sprocket drives a unique and simple friction brake and automatically monitors the line that is pulled from the winch at launch. Brakes prevent the wheels from spinning out nylon line after the plane has been released.

The brake consists of an additional rear wheel hub, a sprocket and bearings mounted on a slotted bracket below the seat post. This smaller sprocket is driven by the second main wheel sprocket. Braking is accomplished by using a rubber shock cord (or bungee) wound around the outside of the hub and a stationary rod anchored to the bike frame. One end of the bungee is fastened securely to the frame. The free end is looped through a hose clamp and fastened to the frame so that it can be easily adjusted (see photos). The amount of braking is easily set by adding or reducing tension on the rubber cord. This simple tension brake works very effectively and, when properly adjusted, provides just the right amount of friction.



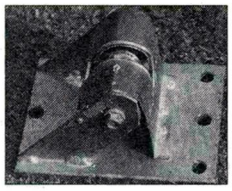
The completed launcher. The hardwood disks are simply bolted through the rear wheel spokes. The triangular base anchored to the seat tube is visible in the foreground.

The base of the winch is a modified triangle of welded steel pipe. The sprocket side of the triangle has a metal strip, to



Alan McPherson of Hawkes Bay, New Zealand, is shown using the launcher. Note the angle of attack at launch and the high rate of climb shortly thereafter.

which a short pipe is welded. This pipe fits into the bicycle seat mount tube and is locked into place by the existing bolt. The tube from which the front fork was removed has a T-spike hammered through it and into the ground to anchor it. Before launch, remember to attach your chair to the winch with a rope or a chain as a safety measure to prevent separation during pedaling.



The turnaround or up-front pulley in detail. The front bicycle hub can be seen through the slot on top.

to the hub support arms and covered by a simple housing. To strengthen the assembly, angle the rods toward the spool. Remember to properly align the turnaround with the spool. Also note that the turnaround can be strapped to a fence post and used successfully.

Keep in mind that some tension must be pedaled into the nylon cord before launch. A few tries, and you will be up and flying. Be careful not to pedal too hard when the glider is well up in the air, because the power could unintentionally fold the glider's wings.

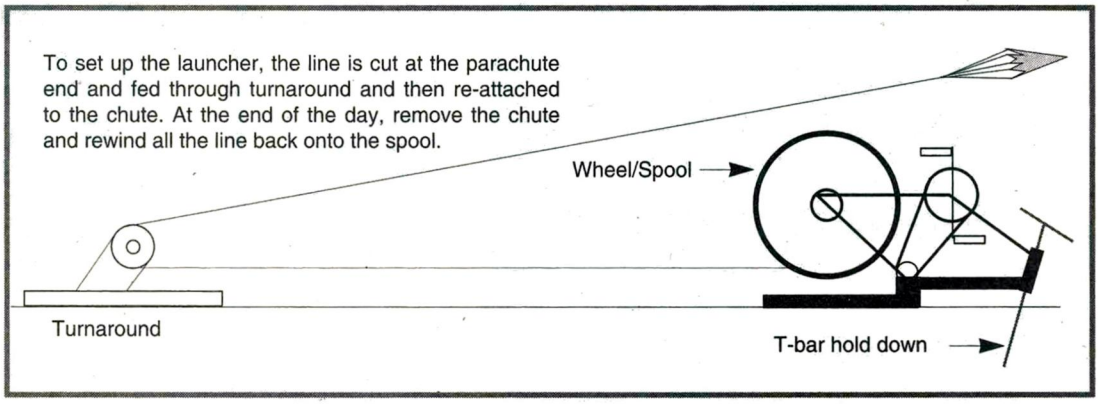
The launcher can be easily transported to and from the field. To disassemble it, simply remove the anchor pins and safety chain, loosen the triangle base, and fold up your chair. All the gear fits easily into the back seat of a car.

Many thanks to Alan—the Hawkes Bay genius—for making our launches simple, yet dramatic.

SPOOL AND LINE

The spool that holds the nylon cord is made of two plywood or hardboard disks that are bolted together through the spokes of the rear wheel. It is loaded with a suitable length of 80-pound nylon cord and the standard parachute and ring are at the end.

A turnaround, or up-front pulley, is made out of the front bicycle hub and bearing with little or no modification. The one shown was designed to feed the line back into its correct position for the next launch. A flat base, appropriately drilled for anchor rods, is welded



MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

ACE R/C INC.

Ultimate Bipe

by RANDY RANDOLPH

Good things come in small packages

THE ULTIMATE BIPE has been added to Ace R/C's* Simple Series line, which includes the P-51, CAP-21, Me-109, Extra 230 and the Beech Staggerwing. Like all of the reasonably priced Simple Series kits, the Ultimate Bipe kit features Ace foam wings, plywood fuselage sides and solid tail surfaces.

The kit includes four wing sections, die-cut plywood and balsa parts, landing gear, formed canopy, a decal trim sheet and all the hardware needed to complete the airplane. Ace recommends a .15 for power and miniservos or microservos for control. The instructions are printed on the plans, and there is a separate sheet that describes the general treatment of the foam wings.

The foam wings are individually wrapped, and that just about guarantees that they won't be damaged. The canopy is wrapped and padded, and the balsa and plywood parts are secured by the wings and the hardware package. The die-cutting is as good as, or better than, the industry standard, and the canopy is of high quality.

Ace has long been a promoter of small airplanes, and their kit of the Ultimate Bipe is a welcome addition to the Simple Series kit line.

The Ultimate Bipe on a cloudy, rainy day.

THE WINGS

Foam wings greatly speed up the building process. On the bipe, each wing consists of halves epoxied at the center. Once they've been joined, they're drilled for the cabane and interplane struts in the top wing and the interplane struts only in the bottom wing. There is little to do to complete the wings other than adding a balsa trailing-edge strip and gluing in the aileron hardware on the lower wing. Pieces trimmed from the ailerons serve as the small center-section trailing edges on both wings. Because the ailerons on the top wing are driven by the ailerons on the bottom wing, hardware is provided for the connection.

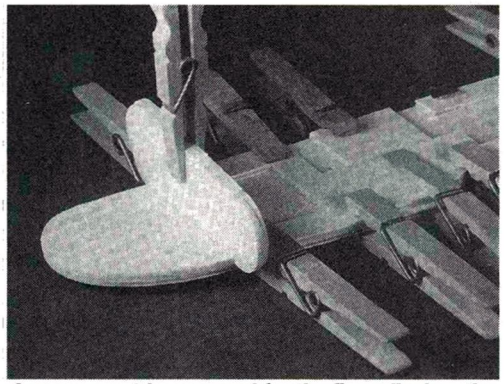
Outer Nyrod is epoxied through the interplane strut holes in both wings and then trimmed flush with the wing. Inner Nyrod is epoxied into the interplane struts and extends an inch above them. When the wings have been assembled on the airplane, the inner Nyrod on the interplane struts is slipped through the reinforced holes in both wings and secured with screws through both wings. This is a good arrangement for mounting biplane wings.

The fuselage must be framed before wing-mounting procedures can be finished.

FUSELAGE CONSTRUCTION

The fuselage is a simple box that consists of plywood sides and formers. First, the ply doublers are glued to the fuselage sides; epoxy is the best adhesive in this case. The firewall should be drilled for the engine mount, the throttle and the fuel line and then glued, with the other plywood formers, to one of the fuselage sides. Use a right triangle to ensure that the firewall and the formers are perpendicular to the fuselage side. The other fuselage side is then glued into place. Again, the right triangle will help to align the sides over each other. When the glue has set, the sides are brought together at the tail, and they're aligned and glued.

At this point, the fuel and throttle lines should be routed through the firewall, and the fuel tank should be mounted. No mention is made in the instructions of installing a tank, but it must be done before the turtle-deck sheeting is put in place. I used padded cable ties to attach the tank to a reinforced balsa mount, then I epoxied the mount to the fuselage sides just aft of the firewall. The top of the tank must be below the bottom of the turtle-deck sheeting. At this point, the cabane struts should be fitted



A space must be reserved for the firewall when the fuselage doublers are glued to the inside of the fuselage sides. A temporary scrap piece of plywood, the same thickness as the firewall, makes an excellent spacer to ensure that the correct size space is provided.

and drilled for the screws that will hold them in place later. Number and mark every cabane so they can be put back into the same slots. The top forward sheeting is then added, trimmed and sanded. At this time, notches to receive the cabane struts should be cut into the turtle-deck sheeting. The cabanes will be mounted permanently after the fuselage has been covered.

It takes a little effort to place the sheeting just aft of the cockpit. Fortunately, Buddy Irwin, the scale guru, came by during this phase of construction and offered two extra hands. If you don't happen to have two extra hands, use instant cement and slowly work with both sheet sides at the same time. Start by cementing the sheets to the aft cockpit former; then work back to the tail and gradually cement in the curve and twist as you go.

FINISHING

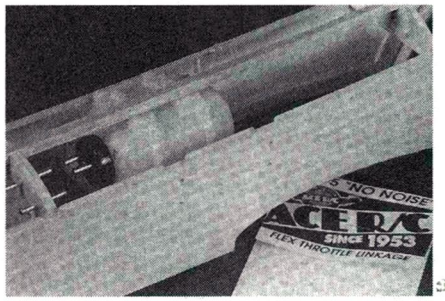
After the bottom wing has been fitted and drilled, the bottom sheeting can be completed. At this point, the fuselage can be sanded prior to covering.

Once the elevator halves have been connected with the provided dowel, the tail surfaces will be ready for sanding and covering.

RADIO INSTALLATION

Miniservos or microservos are almost a must. Even with miniservos, I found it necessary to lodge my larger-than-average receiver in the cockpit. The kit provides 1/16-inch music wire and solder links to connect the elevator and rudder surfaces to their servos. At first, this method of connection seemed too easy, but it worked out very well when installed.

The ailerons on the bottom wings are driven by the standard strip aileron system. The ailerons on the top wing are driven by outboard linkage from the bottom ailerons. It is a good solid system that has stood the test of time.



Although it isn't mentioned in the instructions, the fuel tank and the throttle line must be installed before the turtle deck is sheeted. Here, padded cable ties hold the tank in place on a reinforced balsa floor.

To properly balance the finished airplane, which was powered by an O.S.* .15, I had to add almost four ounces of weight in the nose. If I had used a larger battery pack just behind the firewall, I might not have needed to use the extra weight. I outfitted the bipe with larger wheels, which are necessary for a grass strip.

CONCLUSION

If you're looking for a .15-size plane to add to your collection, check out the Ace Ultimate Bipe. It's easy to build, and its aerobatic capabilities make it fun to fly. Good luck, and enjoy this fine product.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

SPECIFICATIONS

Name: Ultimate Biplane
Manufacturer: Ace R/C Inc.
Type: single-engine, sport-scale biplane
Wingspan: 33 in.
Wing chord: 6 in.
Wing area: 396 sq. in.
Weight: 34 oz.
Wing loading: 11.5 oz./sq. ft.
Airfoil: semisymmetrical
Radio req'd: 4 channels (ailerons, elevator, rudder, throttle)
Power req'd: .10ci to .20ci
Kit price: $54.95

Features: four wing sections, die-cut plywood and balsa parts, landing gear, formed canopy, decal trim sheet and all the hardware needed to complete the airplane.

Hits
- Good die-cutting.
- Ace foam wings included.
- The hardware package is complete.
- When the airplane was assembled, the alignment was perfect.

Misses
- Instructions for fuel-tank installation are a little vague.
- Some warped wood in the kit.

FLIGHT PERFORMANCE

The morning was calm, cool (60 degrees) and cloudy—ideal for a test flight. The O.S. .15 was set a little rich. I checked the controls a final time, and the plane took off.

• Takeoff and landing

The takeoff was smooth, and after one circle, the trimming had been accomplished. With left trim to compensate for a slightly warped fuselage (owing to some warped wood in the kit) and a little up-elevator, the Ultimate slipped through the air quite nicely. As was expected, the ailerons were a little sensitive, but all other flight controls were nice and easy. The plane glides well and requires a nice slow idle to control its tendency to float during landings. Landings are easy to accomplish, and this little plane will perform them well.

• High-speed performance

This is a fairly clean airplane, even with two wings and the attendant strut clutter. The O.S. .15, turning a 7x5 prop at about 17,000rpm, sends the bipe through the air very well. Performance with one of the new .10s would probably be about the same as with the .15. The ailerons are sensitive, but because of the groovy nature of the airplane, smooth flight is not difficult.

• Low-speed performance

There isn't much change in flight characteristics with lower air speed. The ailerons are sensitive well into the stall and, when it occurs, recovery to level flight is good. The rudder becomes more effective when the stall approaches, as is expected.

• Aerobatics

After the test flight, additional elevator throw was needed; once it had been increased, there seemed to be nothing this bipe couldn't do—and do pretty well! Changing to an 8x4 prop seemed to provide more constant speed and improve all maneuvers. The airplane performed inverted flight, knife-edge, snaps, spins, stall turns and rolls as easily as an airplane twice its size. Because of the semisymmetrical airfoil, outside maneuvers require more air space than inside ones, but this is a small price to pay for the easy landings.

CLASSIFIEDS

BUSINESS

SCALE AIRCRAFT DOCUMENTATION and Resource Guide. Larger, updated 1996 edition. World's largest commercial collection. Over 5,800 different color FOTO-PAAKS and 33,000 three-view line drawings. 188-page resource guide/catalogue—$8; Canada-$10; foreign-$15. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [2/96]

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CLUB PATCHES, PINS & BADGES. Embroidered patches, custom hat and lapel pins. Engraved name badges & placards. Generation Products Company; (800) 472-5155. [2/4/6/96]

GIANT-SCALE KITS: From Jim Meister Plans. P-51, Spitfire full wood kits. 109, Corsair, 190, P-47 semi-kits. Squint scale 81", P-40B from Tim Farrell Flight Plans. Custom cutting also available. Send SASE to Starlight Hobbies, 3503 Main St., Stone Ridge , NY 12484, or call (914) 687-4737 between 6-10 p.m. [2/96]

R/C WARBIRDS ON VIDEO. Warbirds 95, Birds of Prey 95, Jumbo Jamboree 95, $19.95 each plus $3 S&H. A.M.R. Productions, P.O. Box 1813, Toms River, NJ 08754. [4/96]

SCALE PLANS AND PHOTO SERVICE: Four scale catalogues; SPPS 163 Superscale Plans, SPPS Documentation Photos, 3-views, Argus Scale Plans Handbook, Argus 3-view Scale Drawings. The Best! $5 each USA and Canada. $10 each overseas air. SASE for enlarging prices. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; phone/fax (910) 292-5239. [3/96]

MAKE MONEY WITH YOUR CAM-CORDER! Sell us your radio-control home videos of planes, cars, boats, etc. For more info, write to: Video Control, P.O. Box 7352, Dept. 850, Jacksonville, FL 32238. [4/96]

FLY DAVE BROWN SIMULATOR. Use your transmitter. Works with Futaba, JR, Airtronics, Hitec. Uses Standard joystick connection. For more info, contact Computer Designs, 8530 N. Montana Ave., Helena, MT 59601; (406) 458-9416. [2/96]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [12/96]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/96]

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AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340. [5/96]

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PLANS ACCURATELY ENLARGED or copied. Any scale, any size. Money-back guarantee. Send $2 for info and a customized poster for your shop. Roland Friestad, 2211M 155th St., Cameron, IL 61423. [6/96]

PLANS ENLARGING. Old model magazines, scanning, plotting, model software. Free information. Concept, P.O. Box 669A, Poway, CA 92074-0669; (619) 486-2464. [2/96]

VACUUM-FORMING—Your one-stop source for books, plastic sheets, components and ready-to-use machines in three sizes. New for '95, Hobby Vac System 2 machines. Free catalogue—(800) 391-2974; Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360. [5/96]

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GEE BEE plans (Benjamin used). Twelve airplanes, 1/3, smaller. Shirts! Catalog/News $4. Vern, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [4/96]

MAKE REAL DECALS with your computer and printer. Send $10 for introductory kit to: LABCO, Dept. MAN 27563 Dover, Warren, MI 48093. [2/96]

PLANS - R/C sailplanes, scale, sport and electric. Old timer, nostalgia and FF scale and sport-powered, rubber and towline. All models illustrated. Catalogue $2. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC V9B 4Z2 Canada. [2/96]

ANTIQUE IGNITION-GLOW PARTS CATALOGUE, ½ inch thick, timers, needle valves, cylinder heads, pistons, points, tanks, spark plugs, racecar parts, engines ½As, Baby Cyclones, McCoys, Phantoms, etc., $10 postpaid. (U.S.), $20 foreign. Chris Rossbach, R.D. 1, Queensboro Manor, Box 390, Gloversville, NY 12078. [2/96]

DETHERMALIZING CERTAINTY. For most free-flight models. Weighs .7 - 1.2 grams. large SASE to Wheels & Wings, P.O. Box 762, Lafayette, CA 94549-0762. [3/96]

AVIATION HISTORY CATALOGUES: old, used, rare and out-of-print books on aviation, WW I, WW II, Korea, etc. To order catalogue, send $1 to: Q.M. Dabney & Co., Inc., Box 42026-AA, Washington, DC 20015. [2/96]

TV SHOW. The producers at Telstar Video Productions, Inc., are proud to present the nation's only weekly half-hour TV show dedicated to model aviation. "REMOTE CONTROL" television can be seen on Satellite Galaxy 4, channel 15 or on cable: The Outdoor Channel. Call (800) 972-4847, or fax (407) 220-4849 for affiliate list or more information. Note to manufacturers: 30- or 60-second commercial spots are available. Advertise your products on national TV to millions of potential customers! [3/96]

PLANS: Old-time and vintage plans including rare Australian and European models. Send U.S. $5 to Aircraft Artwork, P.O. Box 304, Kilmore 3764, Australia, or fax +61-57-821683 for comprehensive catalogue/plans list. Visa/Mastercard welcome. [2/96]

PLANS TO BUILD—more than 70 tools, machines and accessories for you shop. Catalogue—$1. Wood-Met, Dep MAN, 3314 W. Shoff Cir., Peoria, I 61604-5964. [9/96

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GET YOUR HEAD ON RIGHT—you glow plug too! Tork-It precision torqu screwdriver. Free info/torque specifica tions; (770) 736-0916. [3/96

MIXERS & RETRACT CONTROLLERS MicroMixer for flaperons, elevons, V tails, flying wings! MicroRetract sequences 3 servos in slow motion fror one channel! These are tiny 1/3-ounce air borne computer controllers for standar radios! Without connectors, $29 eac plus $2.25 shipping, Quille Engineering, 561 N. 750 W., Hobart, I 46342 (219) 759-5298. [7/96

LARGE-SCALE SAILPLANES AN TOWPLANES—new and used—cal (212) 879-1634, Sailplanes Unlimited 63 East 82nd St., New York, NY 10028. [5/96

MINI TURBOFAN JET ENGINE—715 d for model airplanes. Replaces mos ducted fan units. For catalogue, send $5 JMW, P.O. Box 2311, Dept. 2, Long Beach, CA 90801. [2/96

INSTRUCTIONAL VIDEO. For 50 years I have been a mad keen aeromodeler and am proud that during this time I have been able to help hundreds of less experienced modelers with tips, techniques and advice. Last year, with the encouragement of the Model Aeronautica Association of Australia, I produced a 90-minute video entitled, "How to Build Trim and Fly a Model Aircraft." The response here in Australia was so tremendous that I am pleased to now offer the video to my fellow modelers in the USA. Price is only $US 19.75 plus $5.25 to cover packing and airmail postage. Write to me, Paul Straney a P.O. Box 304, Kilmore, Victoria Australia, or fax +61 57 821 683 Mastercard/Visa welcome. [2/96]

ULTRALIGHT AIRCRAFT—Hear our "Fast Action Classifieds." Call 1-800-411-0042. You can learn to fly the real thing. Buy, sell, trade, kit-built, fixed wings, powered parachutes, rotor, sailplanes, trikes, ballons and more. Stories galore! Sample issue $3. Annual subscription $36. Introductory offer of only $24. (813) 539-0814; Ultraflight Magazine, 12545 70th St., Largo, FL 34643-3025. [2/96]

DEBOLT PLANS: radio control; free flight; control line. Separate SASE for each list to: Fran Ptaszkiewicz, 23 Marlee Dr., Tonawanda, NY 14150-4321. [3/96]

GERMAN AIRCRAFT WW II—handbooks, service-parts lists, instruction manuals. List for $2. Udo E. Hafner, Konigsallee 69, D-71638 Ludwigsburg, Germany.[2/96]

HISTORIC REPLICAS: DISCOUNTS! Luftwaffe bullion unit emblems, Flying Tigers, 94th Aero, Lafayette Escadrille accessories, Air Force bullion patches, shirts, wings, medals, beer steins, scarves, WW I squadron pins from $4.95. Free gift with order. Catalogue $1, refundable. Company of Eagles, 875A Island Dr., Ste. 322N Alameda, CA 94502. [3/96]

CLASSIC AIRCRAFT COLLECTION, LTD. presents post war and WW II I.D. Recognition Models. Quality replicas, black and gray plastic originals are displayed in aviation museums worldwide. 1/72 scale, 170 different models. **The Racer Series of the Golden '30s** museum-quality models 1/48 scale in magnificent color and detail, 12 different models. **The Seaplane and Flying Boat Series** of 40 years of aviation history. Museum-quality models in authentic color and detail, 1/72 scale, 14 different models. Free brochures, Classic Aircraft Collections, Ltd., 3321 Suffolk Ct. W. #105, Fort Worth, TX 76133; (800) 289-3167. [2/96]

R/C SKYDIVING: New Ram-air parachute now available. Illustrated catalog $1. R/C SKYDIVERS, Box 662L, St. Croix Falls, WI 54024. [6/96]

TALES OF AN ANCIENT MODELER: Funny, nostalgic stories of how modeling used to be. With 100 photos spanning 60 years. $15 pp. USA. Norm Rosenstock, 124 Granada St. RPB, FL 33411. [3/96]

PLANS—Flying Flea (full size) plans: HM14 $45, HM16 $125. Archive, Box 892, Wooster, OH 44691. [6/96]

PLANS: Planes of the Golden Age of Aviation. 1/4 & 1/5 scale plans, etc. Catalog $1. Norm Rosenstock 124 Granada St., RPB, FL 33411 [3/96]

FREE XQ-500 FUEL LUBRICANT SAMPLE! Improves performance, faster starts, cooler operating temperature, longer running time between fill-ups. Amazing results! Rush 2 stamps. PMP, 84 Park St., Kalispell, MT 59901. [4/96]

BUILD BETTER, FASTER MODELS. Britain's finest R/C magazines will show you how! Whether you are a modeler or a flier, we have just the right magazine for you. To find out more about the magazines we handle, send a large SASE to Wise Owl Publications, 4314 W. 238th St., Dept. MA, Torrance, CA 90505. [2/96]

HOBBYIST

KITS WANTED: Monogram: Speedee-Bilt G&H Series balsa wood and plastic kits. Also, T series Superkits; Guillow: WW and 100 series World War I kits with 18-inch wingspan; Other discontinued balsa-wood kits by Megow, Cleveland, Joe Ott, Comet, Berkeley, Ideal, Ace-Whitman, Maircraft, Hawk, Scientific, Peerless, Duncan, California, etc. Collector will pay top prices. George Santikian, 7285 N. Channing, Fresno, CA 93711. (209) 439-3363. [2/96]

WANTED: Old tin toy airplanes, robots, motorcycles, race cars, Popeye, Mickey Mouse, also old Dinky, Meccano toys, Matchbox, WW II games. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686. [2/96]

1/3-SCALE LANIER LASER, Sachs 4.2, CMI smoke system, Davis Diesel pipe, all hardware to complete, ready-to-cover, built by a professional model maker-Asking $675. Miss Circus Circus Hanno Prettner designed T.O.C. style aerobatic monoplane 80-inch span, ST-3000, 6 servos, 13.5 lbs., flown 5 times. Asking $650. Mueller Comet 89A f3b sailplane RTF but never flown, servos installed 141's—$650. Ron Carter, 827 North 900 East, Bountiful, UT 84010; (801) 298-0406. [2/96]

WANTED: Great Planes Aero Commander Shrike kit. Curt (405) 842-7677. [4/96]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/96]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [5/96]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/96]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 3706 North 33rd, Galesburg, MI 49053; (616) 665-9693, or (800) 982-5464. [4/96]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [5/96]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

ENGINES, KITS & ACCESSORIES: 35-year collection for sale. For listing send #10 SSAE to: Ed Hagerlin, Box 1980, Overton, NV 89040. [2/96]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952; "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C. Canada V0R 1L1. [2/96]

COLLECTION FOR SALE: Over 350 kits from 40's, 50's, 60's, F/F, R/C, U/C, Rubber, Solids, Jetex. Send SASE ($.55) to Dr. Frank Iacobellis, 62 Palisade Rd., Rye, NY 10580, or call (914) 967-5550. [2/96]

MODEL MOTORS WANTED: most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [6/96]

WANTED: Cox, Wen-Mac, Testors, etc. Gas-powered plastic cars, planes, boats. Please call or write. Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [4/96]

SLOT CARS WANTED: Cox, Aurora, Tyco, etc. 1960's, 1970's vintage; any scale. Please call or write. Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [4/96]

WANTED: 12-inch G.I. Joe and Captain Action. Jeff Gilbert, 423 S. Randolph St., Princeton, IL 61356-1960. [3/96]

P-38 LIGHTNING—LOVE IT? Join a group of P-38 modeling and full-size enthusiasts. Share modeling, flying, historic facts and articles about the P-38. Entering fee of $15 covers newsletters and club patch. For more information, write: P-38 M.O.I. Ron Parker, 3003 Windchase, #1003, Houston, TX 77082-3444. [4/96]

ANTIQUE MAGAZINES: Complete private collection. Bill Barnes Pulps, Air Trails, Flying Aces, others, $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3. [3/96]

WANT TO BUY: Cox .35 and .40 engines. Thanks. Please write Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [3/96]

WANTED: Futaba single-stick helicopter radio, whole system or transmitter only. Robert (814) 825-8404. [2/96]

INTERESTED IN OLDER SCALE airplane balsa kits, Cleveland plans, and wood kits of race cars. Good used engines, building supplies/material, radio control accessories, etc., are also of interest. Please list condition and best price. I will buy one piece or entire collection. Randy Christensen, 1113 Balboa, Denison, TX 75020. [2/96]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/96]

WANTED: Built or partially built scale Cessna 150, 152, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; phone (714) 768-0585; fax (714) 458-6455. [12/96]

CARS. Selling model collection, 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA (509) 965-0670. [6/96]

SLOT CARS AND SLOT-CAR-RELATED ITEMS wanted from the 1960s. Will pay finders fee. Emmett Hunt, 39651 Michigan Ave., Canton, MI 48188. (313) 729-7568 (SLOT), fax (313) 729-8780. [4/96]

PAYING $60 TO $125 for toy metal outboard boat motors: Gale, Seafury Twin, Oliver, Johnson, Mercury, Scott, Evinrude. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686. (616) 941-2111. [5/96]

EVENTS

LARGEST SWAPMEET AND AUCTION IN ILLINOIS! 140 tables. Hosted by the Tri-Village RCer's on Saturday, February 3rd, 1996, at the DuPage County Fairgrounds, Wheaton, Illinois. Vendor set-up at 8:30 a.m. General admission at 10:00 a.m. Dedicated selling hours: 10 a.m. - 3:30 p.m. FREE Auction at 4 p.m. FREE parking, hot food, door prizes, raffle and more. Reserve tables early—last year's show was a blow-out! Multiple table discount. Call John at (708) 837-1343 or Jim at (708) 439-6922 to reserve tables or obtain flyer. [2/96]

MODEL AIRCRAFT SHOW AND SWAP MEET! River City Radio Controllers presents our 6th annual show on Saturday, February 24, 1996 at E. P. "Tom" Sawyer State Park in Louisville, KY. Swap Meet set-up at 10:00 a.m. with show running 12:00 noon to 5:00 p.m. Admission: $2. Swap Meet table: $6. Door prizes every hour! Static Model Competition! Free parking! For info or reservations call Tom at (502) 968-8977. [2/96]

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. Please make all checks payable to: **AIR AGE, INC. SEND AD AND PAYMENT TO: Elise Silkowski, CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035, or call (203) 834-2339.**

MODEL AIRPLANE NEWS

PRODUCT REVIEW

The most feature-rich electric flight charger available

SR BATTERIES Deluxe Smart Charger/Cycler

by TOM ATWOOD

WHEN I recently returned my Standard Smart Charger/Cycler (SC/C) to SR Batteries* to be upgraded to the Deluxe version (requires only a software update), ter and receiver packs. It packs a host of special features not found in any other charger designed for electric flight. For an overview of the Standard SC/C's basic functions, see Dave Baron's review of that version in our August '92 issue. In this article, I'll outline the upgrades found in the Deluxe SC/C, and I'll reiterate a few of the basic features that set this charger apart.

An electric flight peak charger should have:

- Fast-charge and slow-charge capability (slow-charge can be used to balance a pack that has been on the shelf for a few weeks).
- Adjustable current output, so that you can fast-charge or slow-charge a pack whatever the capacity of the Ni-Cds.
- Constant charge current.
- Display of sufficient data to confirm that no "false peak" has occurred.
- Capacity to charge more than seven to 10 cells (so you can venture to more sophisticated systems).

These basic features enable you to charge your batteries with relatively little fuss while at the flying field. But what if you want extra "bells and whistles"? Let's look at the features offered by the Deluxe SC/C.

Note that the Deluxe SR Smart Charger/Cycler's faceplate has jacks for the 12V input line, the battery being charged and the battery being cycled or evaluated by the unit's ESV (with load), and for the motor and battery when current (up to 250 amps) is being measured. Absent are the 20A fuse socket (earlier found on the SC/C) and the attached cords sported by most chargers. There are three buttons; a legend shows the order in which they are to be pushed to initiate different functions. You can climb through the simple menu or just use the legend; operating the SC/C is never a problem.

Larry Sribnick, owner of SR, remarked that the unit must have been trucked around a lot; the ruggedly built charger showed signs of wear and tear. It indeed had been, and that's a testament to how much I've come to rely on the SC/C. It has been a faithful companion on countless excursions to the flying field. I've used it in January in Connecticut and in August in Arizona, and in three years of continual use in all kinds of weather, it has never failed to do the job. Or should I say its several jobs?

The SC/C is a charger, cycler and diagnostic tool for assessing the health of an electric flight power system as well as that of the radio battery packs. It includes a 250A digital ammeter and in the Deluxe version, an expanded-scale voltmeter (ESV) for the radio transmit-

SPECIFICATIONS

Type: Deluxe Model Peak Charger/Cycler
Power source: 12 volts
Charges: 2 to 36 cells
Cycles: 1 to 36 cells

- 1A to 5A adjustable, constant-current fast-charging
- 0 to 200mA adjustable slow/trickle-charging
- Fast field charging and ESV for Tx and Rx packs
- Overtemp charge inhibit
- 250A digital ammeter
- Low source voltage detection
- Microcomputer controlled
- Reverse-polarity protection
- "Smart" cooling system

List prices
- Deluxe Smart Charger/Cycler—$349.95
- Standard Smart Charger/Cycler—$299.95
- Cost to upgrade Standard to Deluxe—$50

FEATURES

The Deluxe SC/C contains a Motorola microcomputer that processes information such as pack voltage, air temperature, pack temperature, charging rate, charging current, charge time, number of cells, type of pack and supply voltage.

The Standard SC/C has five modes. It can be a fast charger, slow charger, fast field charger for receiver packs, cycler and high-rate digital ammeter. The Deluxe SC/C can also be a fast field charger for transmitter packs, and it can operate in a sixth mode as an expanded-scale voltmeter. Whereas the Standard SC/C charges two to 28 cells, the Deluxe unit will charge up to 36.

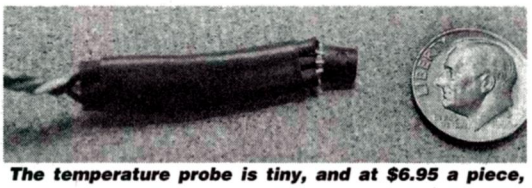
Use of the unit is simple: connect the power source, turn on the SC/C, connect the battery pack to be charged or cycled, push the appropriate button or buttons on the control panel and, if applicable, adjust the charging current level. You are also advised to place the tiny temperature probe in the battery pack (see photo).

The SC/C has an on/off switch so that you can avoid the spark that can occur when you connect a charger to its power source; the instructions warn that you should turn the SC/C off *before* you connect it. (If you use a car battery as a power source and it is venting gas, a spark could be hazardous.)

Let's assume you simply want to peak-charge a pack. Once the SC/C has determined that the battery has been peak-charged, it will switch to a true slow charge. When this happens, the SC/C signals you with either a short beep or a long

continuous tone (your choice). The wide-angle liquid-crystal display (LCD) shows the peak voltage reached, how long the charge took and what the power-supply voltage was when the pack peaked. During operation, it also reports the charging current.

Fast-charging a just-used pack that has not cooled sufficiently can degrade the cells' capacity. The Deluxe SC/C has an "overtemp charge inhibit" (OCI) system that prevents this from happening. Suppose you have just completed a flight and the pack is very warm or hot. Before the Deluxe SC/C starts fast-charging, it first reads the temperature of the pack through its temperature probe. If the pack is too hot to be recharged, it beeps and reports this on the LCD. At that moment, you have 20 seconds to set the fast-charge rate. The Deluxe SC/C then turns itself off, but continues to display the pack's temperature while it waits for it to cool down. When the pack has cooled sufficiently, the Deluxe SC/C automatically starts the fast charge.



The temperature probe is tiny, and at $6.95 a piece, not expensive; SR can build them into battery packs as an option.

• **Redundant systems.** The SC/C has redundant systems to ensure that your pack really has been peak-charged. When some chargers experience a drop in supply voltage beyond some critical value, they either drop back to a slow charge or shut off. If you have not been paying close attention (and/or if the charger doesn't report the supply voltage), it's possible to overlook the status of the source battery and just assume you have a full charge in your charged battery. That, in turn, may mean your plane will be landing sooner than you planned....

With the SC/C, if for any reason the supply voltage of your 12V power source ever drops below 10 volts, the SC/C will cut off, beep and display a message indicating that charging has been discontinued because of the low source voltage. The Deluxe SC/C allows you to set this cutoff voltage at 10, 11, or 12 volts. This feature was specifically designed to allow you to monitor your car battery voltage when you do a lot of charging from it at the flying field. To be conservative, set the SC/C at a 12V cutoff, and if you ever need to start the engine and recharge your source battery, you'll know.

Batteries are complex systems made of individual cells. If a pack is unbalanced, i.e., some cells have less of a charge than others, and you subject the pack to a rigorous fast-charge, some of the cells will peak before others. Any peak charger, however, looks at the total picture—the voltage of the entire pack. It is possible, therefore, for any peak-charging circuit, in rare instances, to be fooled. If some cells have peaked and the charger doesn't stop charging, the fully charged cells will begin to get hot, and their capacity may be degraded in the process. This may be unlikely, but it is possible.

To avoid this, you're advised to balance the cells in any pack that has sat unused on the shelf for more than a few weeks. Although there's an acceptable range of slow-charge rates for balancing, a good rule of thumb is to slow-charge a pack for 14 to 16 hours at a charge rate that is 1/10 of its normal capacity, e.g., charge a 1200mAh pack at 120mA. The slow-charge function lets you charge a pack at a rate of from 0 to 200mA, so you can, in effect, either slow-charge or trickle-charge.

But suppose a modeler has overlooked this basic battery maintenance, or that the unlikely has happened: a cell has aged or has been damaged in such way as to fool the charging circuit. The SC/C is equipped to handle this through redundant charge-cutoff modes.

In addition to detecting a peak charge by sensing the slight reduction in battery-pack voltage that accompanies it, the SC/C will stop charging if the pack's temperature rises above a computer-calculated cutoff point. You can also program the charger to stop charging after a set time. If it typically takes a pack of a given capacity about 18 minutes to charge, you can set the SC/C to stop charging after 20 minutes. Given the redundancy of peak, temperature and timed charging, you are unlikely ever to overcharge a pack. This contributes to the pack's health (maintains the capacity) and longevity, and it also avoids hazards if the pack has any damaged cells.

• **Fast field charging.** The Deluxe SC/C has a temperature-compensated fast-field charging mode. It will automatically charge your 4- or 5-cell receiver packs as well as your 8-cell transmitter pack up to about an 80-percent-charge level (the Standard SC/C only fast field charges up to 4-cell packs). During the charging cycle, the SC/C's microcomputer monitors the ambient temperature through the temperature probe and readjusts the charging circuit so that the SC/C will cut off at the appropriate time without risking an overcharge. The 80-percent value reflects SR's conservative approach to transmitter and receiver packs, which are critical components.

• **Cycling.** To cycle packs, the SC/C lets you choose any of 10 discharge rates from 100mA to 1,000mA. The SC/C takes the pack down, without going too low, and displays the exact capacity of the pack in mAh. The Deluxe SC/C will do this for any battery with one to 36 cells. (The Standard SC/C cycles batteries of from one to 28 cells.)

• **ESV.** This tells you how much charge remains in your receiver and transmitter packs. You choose a load of from 100mA to 1,000mA to be applied to your pack; then connect the pack and press a button. The Deluxe SC/C will automatically apply the load for a time and then signal you on the display that the pack is OK, even as it displays the pack's voltage. If the pack hasn't been charged enough to fly safely, the Deluxe SC/C will beep, and its display will advise you not to fly.

• **Operating the Deluxe SC/C.** The legend on the face of the SC/C tells you which switches to press and in what order. Despite the variety of functions it performs, you'll never "forget" how to use this charger. I haven't detailed the actual use of the charger because it is, in fact, so simple; trust me. The jacks for connecting the power source, the battery to be charged, or the battery to be cycled are all color-coded Sermos-brand connectors.

IS IT FOR YOU?

If you are truly serious about electric flight, or if you simply want the most function-rich computerized charger available and are willing to pay the premium, then I recommend the SR Deluxe Smart Charger/Cycler. It does many things, and it does them well. Its designers put a premium on safety and had the health and longevity of your battery packs foremost in mind. I have used the Standard SC/C for years; it has never failed to do the job, and it has withstood a lot of rough handling. The upgrades embodied in the Deluxe SC/C only improve an already outstanding product.

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

LATEST PRODUCT RELEASES

CARLSON ENGINE IMPORTS

1950 .09 Elfin Replica Engine

This Russian-built engine features ABC construction and can turn 7x3 to 9x4 props. Its prop driver is shouldered to accept standard 1/4-inch and 6mm props. Specifications: bore—0.500 inch; stroke—0.475 inch; displacement—1.49cc (0.09ci); weight—2.64 ounces. A complete catalogue is available for $1 (free with order).

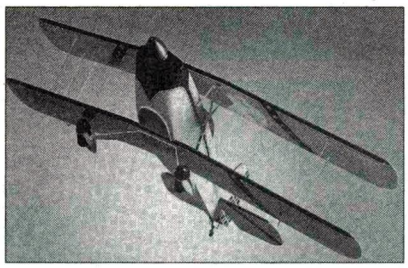
Prices—$55; $4 (4mm spinner nut); plus $4 S&H.

Carlson Engine Imports, 814 E. Marconi Ave., Phoenix, AZ 85022-3112; phone/fax (602) 863-1684.

CARL GOLDBERG MODELS INC.

Bücker Jungmann

This high-performance biplane easily performs extended vert cal maneuvers, knife-edge loops and snap and tumbling comb nations. The ki includes a preci sion-formed cow canopy and whee fairings, scale land ing gear and a self positioning, forme cabane system t ensure trouble-fre alignment. Specifi



cations: wingspan—64¾ inches; wing area—1,152 square inches length—57¼ inches; weight—8.8 to 9.8 pounds; engin required—.61 to 1.20 2-stroke or .91 to 1.50 4-stroke.

Price—$299.99.

Carl Goldberg Models Inc., 4734 W. Chicago Ave., Chicago IL 60651; (312) 626-9550; fax (312) 626-9566.

GLOBAL HOBBY DISTRIBUTORS

Cessna 182 EZ-ARF

This Skylane comes built and covered, and it has hardware, accessories and an instruction manual. It features a molded, tinted windshield, molded wheel pants and cowl, simulated panel lines and rivets, functioning flaps and removable, streamlined wing struts. Specifications: length—58 inches; wingspan—72 inches; wing area—724 square inches; flying weight—8 pounds; engine required—.60 to .65 2-stroke; radio required—5-channel.

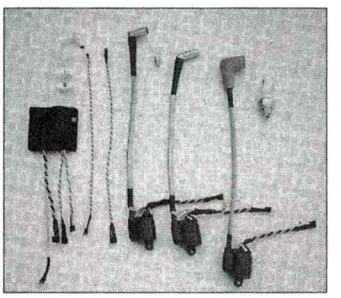
Part no.—126250; **price**—$399.95.

Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

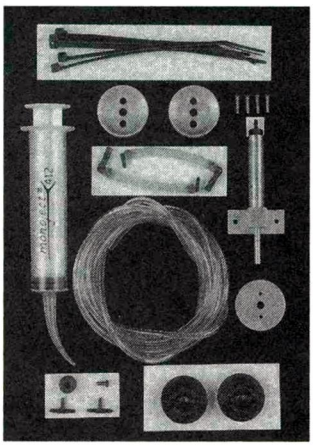
CABRAL SYSTEMS INC.

ProSpark Limiter Series Electronic Ignition

This system is now available with an rpm-limitin option that's designed to protect 4-stroke engine against damage that's caused by over-revving. Micro computer-controlled timing provides easier starting improved idle an maximum engin performance. Pro Spark comes wit various spark plug-lead configu rations, and it ca be used with mini ature and standard size plugs.



Cabral System Inc., 2459 S.E. Tualatin Valley Hwy. #465, Hillsboro OR 97123-7919; (503) 629-9378; fax (503) 648-2261.



BOB FIORENZE

Proportional Hydraulic Brake System

This 29-gram system comes with a master cylinder, drill guide, instructions and all hardware for installation, and it uses fluid instead of air for braking. It can be activated by applying down-elevator or by using an optional auxiliary channel. The universal hubs fit any 5/32-inch-diameter landing-gear wire, and the drums can be used with any rims and tires. For an illustrated catalogue, send $2 to Bob Fiorenze.

Bob Fiorenze, P.O. Box 953042, Lake Mary, FL 32795-3042; (407) 327-6353.

TOP FLITE

LustreKote

Available in 24 colors, Advanced Formula LustreKote matches Mono-Kote in color and glossiness. You can paint cowls, turtle decks, wheel pants, struts and even entire models quickly and easily. LustreKote is the most fuel-proof, one-part paint available.

Price—$7.99 each.

Top Flite; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

KASTNER ELECTRONIC DESIGNS

Battery Pack Gauge

This milliamp (mAh) meter can be used with 4- to 24-cell battery packs and can check the capacity of cells and packs. It can also be used to check the power consumption of transmitters, receivers, servos, etc., and it comes with an operator's manual. Specifications: size—2.6x1.6x0.6 inches; weight—0.2 ounce; power consumption—0.25mAh (max), 0.1mAh (typical); measured current range—0 to 2,000mAh.

Price—$99.95 (plus $3 S&H).

Kastner Electronic Designs, 4369 S. 49th St., Dept. M4, Greenfield, WI 53220; phone/fax (414) 541-3768.

SONIC-TRONICS INC.

Servo Arms

These servo arms are injection-molded of engineered composite materials that contain long carbon fibers for stiffness and strength. Sets are available for Futaba, DAD, Airtronics, JR, Cox/Sanwa, Hitec, Tower and Ace servos. For more information, contact Sonic-Tronics.

Sonic-Tronics Inc., 7865 Mill Rd., Elkins Park, PA 19117; (215) 635-6520; fax (215) 635-4951.

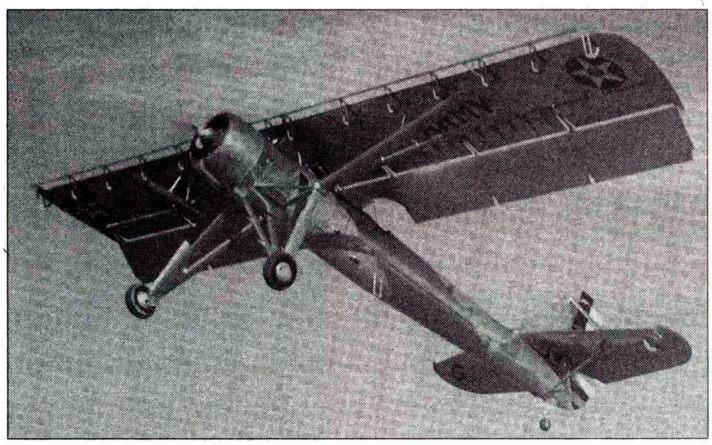
Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, 251 Danbury Rd., Wilton, CT 06897.

Name THE PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

CONGRATULATIONS to P.B. Landray for correctly identifyin the November '95 mystery plane. The Miles M 57 Aerovan, built i Woodley, Berkshire, England, was first considered for military us as an air ambulance and freighter. After the War, it was to be used as a passenger transport vehicle, but of the 100 that wer planned for production, only 55 were completed; financial difficulties precipitated the end of the project. An interesting feature c this high-wing cantilever plane is the Miles auxiliary aerofoil flaps that are aft of the trailing edges and inboard of the slotte ailerons. The plane's wooden frame was covered wit plywood, and the metal tail boom supported the cantilever tail unit. The pilot's compartment in the nose had two seats. The 36-foot-long, 50-foot-span Miles M 57 was 13 feet, 6 inches high (over the rud der), and it had fixed gear with Oleo suspension on th strut. Powered by two 140hp deHavilland Gipsy Majc or 150hp Cirrus Major 4-cylinder, in-line, invertec air-cooled engines, the plane's cruising speed wa 110mph with a 450-mile range in still air. The pro pellers were either fixed-pitch or constant-speed, an. the maximum takeoff weight was 5,900 pounds.



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscriptic to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the MONTH

South Bend Radio Control Club Inc.
c/o Jack Allinger, Editor
244 Willow Dr., South Bend, IN 46637

"THE FLYPAPER"—the monthly newsletter of the South Bend R/C Club—is beautifully produced and illustrated with many photos of members helping out (mowing the field, delivering event flyers and making copies of the club newsletter). It's obvious that this active club appreciates its members and, judging from the smiles on the faces of the helpers, they enjoy themselves as well.

As winter approached, members were kept busy winterizing their flying field and planning their annual swap shop to ensure that their workbenches would be full during the long dark nights of the building season.

We like the special sections that welcome new members and congratulate members who have soloed. In the "Field Safety" column, the safety officer tells how a good "spotter" can help even experienced pilots avoid crashing and other mishaps.

Another interesting story: one of the club families, the Binders, recently hosted a foreign exchange student from Bogota, Colombia. The student, Miguel Orsorio, had requested that he be placed with an American family who are interested in R/C. We're sure that Miguel enjoyed being a part of the South Bend R/C Club for a semester.

For their dedication to fun and safety, we award the South Bend R/C Club two complimentary subscriptions to *Model Airplane News*. Congratulations!

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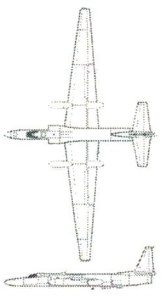


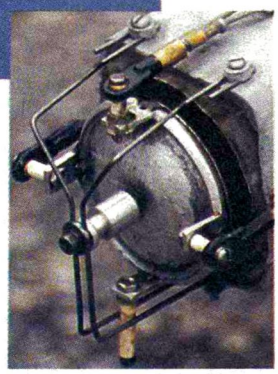
VTOL HARRIER JUMP-JET

Eric's Harrier in full VTOL mode; at an altitude of about 30 feet, it's just about to sweep the main thrusters aft to push the model into forward-flight mode.

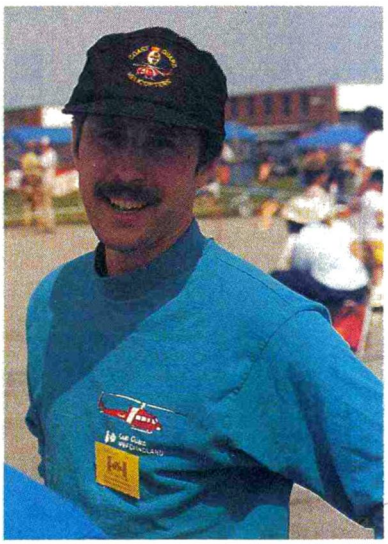
Canadian modeler Eric Dainty is the first to successfully build and fly an R/C model VTOL Harrier Jump-Jet that takes off vertically, transitions to normal forward flight and then lands again vertically. It wasn't well-publicized, but he made the first successful transition in June 1993 at the Bay of Quinte Jet Rally on the shores of Lake Ontario.

Since then, Eric has improved his techniques even further and is now building a more accurate scale version of his original sport-scale prototype test bed—incorporating his latest techniques and weight-saving ideas. The flight I saw was extremely impressive; the model took off and landed at about 75 degrees to the horizontal, and it transitioned into forward flight with speeds of about 80mph—all this in very poor weather with strong winds blowing at about 40 degrees to the direction of takeoff.

The heart of the propulsion system is Eric's own-design fiberglass ducting that diverts the high-speed air from the back of the highly modified Dynamax ducted-fan unit into four separate paths. Most of the airflow is split sideways into a pair of ABS molded thrusters, which are controlled by a single servo for sweep angle and, hence, are in "hovering" or "forward" flight mode. A small circular duct continues rearward; it contains the tuned pipe and takes air to the most innovative part of the model: the multi-directional thrust diverter behind the vertical stab. This is actuated by four snakes (much like the swashplate in a helicopter), and in the hovering mode, it gives directional control. Finally, from an oval hole behind the fan shroud, a little air is bled upward and through a pair of small air ducts inside the traditional built-up wing to simple "waste-gate" valves at each wingtip. These are used to hold the wings level in "hovering" mode and are connected to the aileron function. Normal aileron, elevator and rudder function take over when forward flying speed has been achieved.



Yaw is accomplished by the multi-directional thrust diverter that's behind the vertical stab.

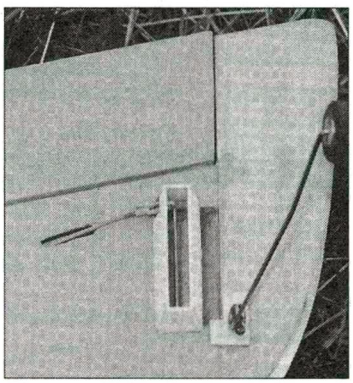


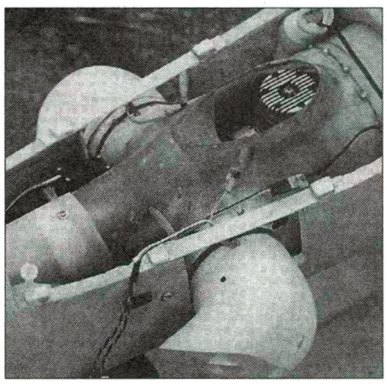
Canadian Eric Dainty looks pleased after another successful sortie with his Harrier Jump-Jet at the 1995 Bay of Quinte Jet Rally.

The motive power for the machine is an O.S. 91 VRDF engine that's mated to a modified Dynamax fan unit that exhausts through a standard Jet Model Products pipe. The fuselage is of ordinary, lightweight, blue foam-and-balsa construction and, incredibly, the ready-to-fly model weighs less than 7 pounds—including the small 8-ounce fuel tank containing very high-nitro fuel, which gives a 3-minute flight time.

For more than five years, modelers across several continents have been trying to build a radio-controlled Harrier Jump-Jet that has true VTOL capability as well as forward flying performance. Congratulations, rather belatedly, to Eric Dainty for having persevered and succeeded where others gave up. Perhaps the most amazing thing about this modeling feat is that Eric, who is a rather shy and modest sort of chap, doesn't even have a great deal of model flying experience behind him; he has been flying R/C only for four years!

—Mike Cherry





Above: a little air released through the simple "waste-gate" valves at each wingtip is used to hold the wings level in hovering mode and is connected to the aileron function. Above right: hovering or forward flight is controlled by an airflow that's split sideways by two molded-ABS thrusters that are controlled by a single servo.